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**Notes and Beyond: How New
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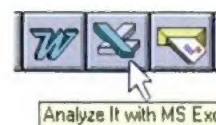


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Inside

The Changing Office: Now what does that mean? For *PC Magazine*, the answer began as a huge flowchart in Michael Miller's office—our way of categorizing new products designed to foster group productivity. It didn't take rocket science

for us to realize that the term *groupware* had become outdated and imprecise. In order to describe the changing office we had to do nothing less than invent a new taxonomy for categorizing the various kinds of groupware.

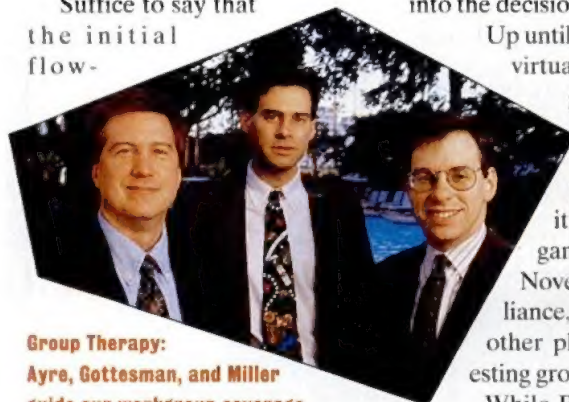
Suffice to say that the initial flow-

you want to run your business as with what software and systems you want to run. Issues such as what data types you want to use, what your workflow process should look like, and what sort of flexibility you'll need all figure into the decision.

Up until now, Lotus Notes virtually defined the groupware category.

While Notes is certainly a prime contender, it's not the only game in town. The Novell/WordPerfect alliance, Microsoft, and other players have interesting groupware strategies.

While Rick Ayre, executive editor for software, and Ben Gottesman, technical director for software, had the dubious honors of leading the charge, the pages that you are about to read reflect the input and inspiration of every talent we have on our staff. We made our first draft of the Changing Office flowchart nearly five months ago. We've opened and modified that file at least 100 times, with heated debate and many hours of lab testing. We've reviewed 89 products that can change the way you work, and we've even reproduced our flowchart in the issue.—*Robin Raskin*



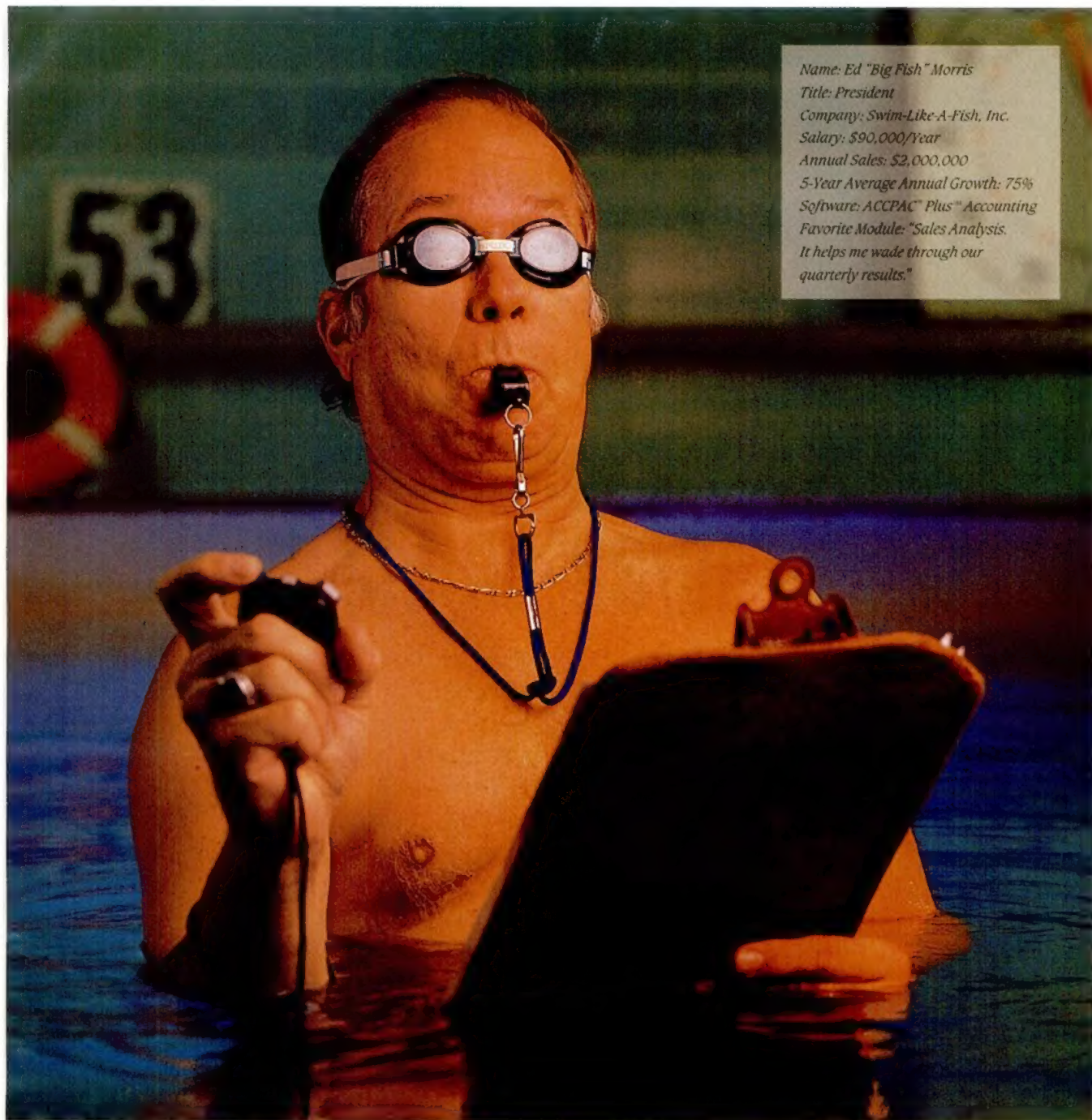
Group Therapy:
Ayre, Gottesman, and Miller
guide our workgroup coverage.

chart has been reengineered countless times during the creation of this special issue of *PC Magazine*. We've sliced and diced, defined and refined categories of products. We've covered document management, image management, workflow, videoconferencing, group discussions and meetings, scheduling, and electronic whiteboards, all with the goal of making certain that you'll make the right choices.

At the heart of groupware are some fundamental questions that have as much to do with the way

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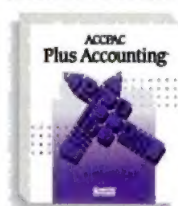
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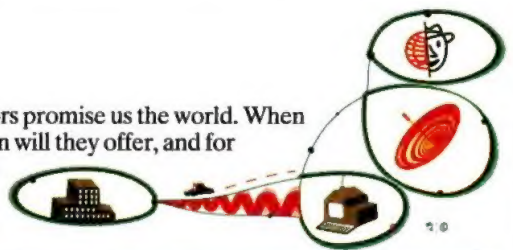


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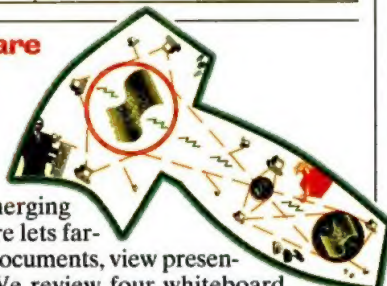


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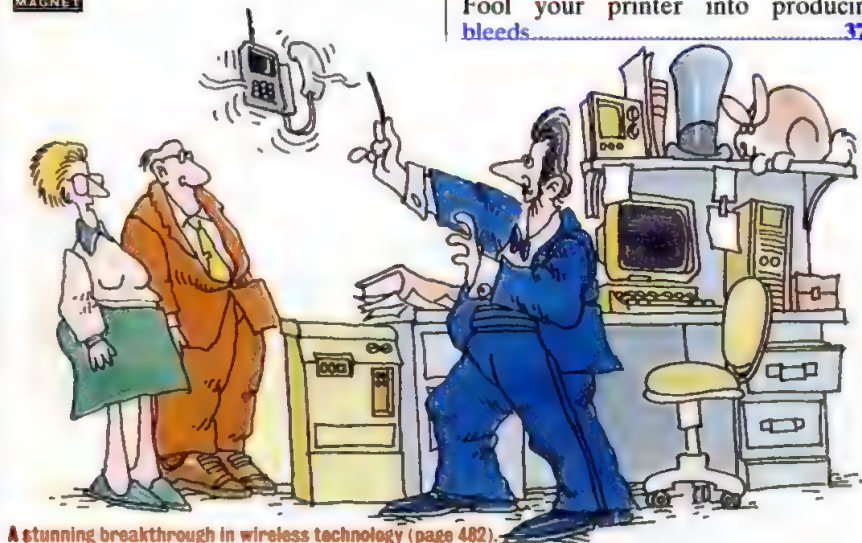
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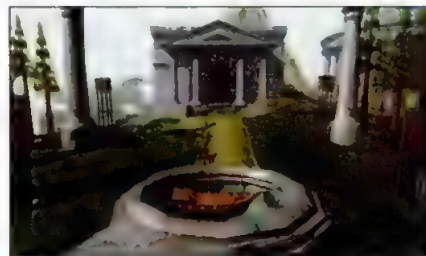
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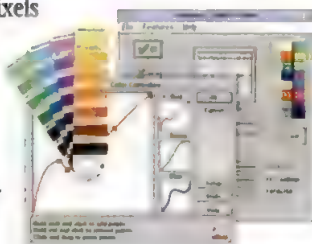
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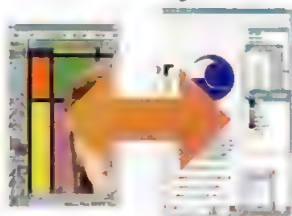
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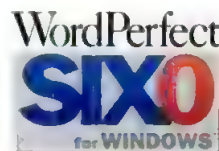
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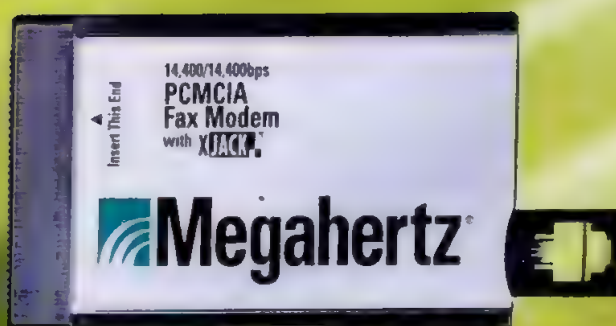


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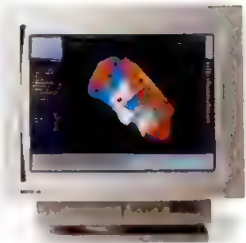
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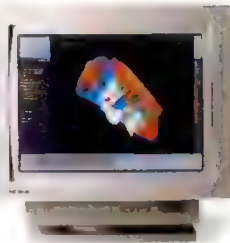
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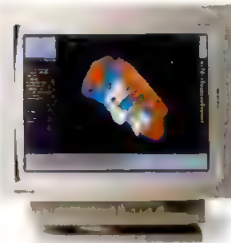
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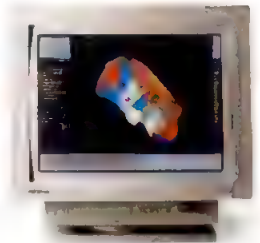
1985—World's first flicker-free overscan monitor



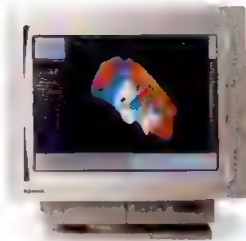
1989—World's first digital monitor



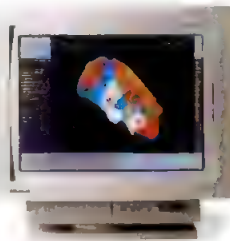
1990—World's first low-radiation (MPR II) monitor.



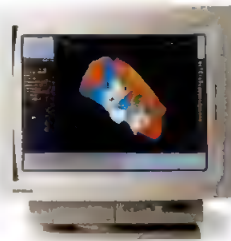
1991—World's first extremely low radiation (TCO) monitor.



1993—World's first powersaving (TCO '92) monitor



1993—World's first on-screen adjustments



1993—World's first 102 kHz FCC B monitor.



March 15, 1994
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Letters

MONOPOLIZING RESOURCES

In the Pipeline column "Games That Want It All" (March 29, 1994), Robin Raskin complains that "game software developers should drop their selfish 'we want it all' attitude" and release some of the stringent memory and configuration requirements that most new games place on system resources. Yet new games are what push PC hardware to its limits, and those memory and setup requirements are the price you pay to have the latest and greatest full-motion dinosaurs jumping out of the screen at you in 3-D. If developers relaxed their requirements, the quality of the games would suffer.

*Craig J. Lipinski
via the Internet*

It was delightful to read Raskin's column. There's always some solace in knowing you're not alone in your struggles. The sad part is that the perpetrators of this multimedia mayhem probably still won't get the message.

*Charley Cross
via the Internet*

Raskin hit the nail on the head with her column. It's true that most of the games are greedy when it comes to resources, and have infinite incompatibilities with drivers of all sorts. Home computing can become a nightmare, and only a very few game manufacturers release products that nearly always run with ease.

*Saar Blitz
via the Internet*

It seems that Raskin blames the home-computing nightmare on the application developers. But the problem is really caused by the inability of hardware, operating systems, and applications to work properly together. Operating systems, especially DOS, are most culpable. DOS is getting too old and inflexible to handle today's monster PCs and monster software; OS/2 or even the Microsoft Windows platform are better bets than DOS.

*Stephen Deng
Van Nuys, California*



*New games are what
pushes computer hardware
to its limits.*

After two nights spent trying to get my son's new CD-ROM game to work, I am returning the product. As the father of a now very disappointed 11-year-old, I can tell you that the time and effort spent overcoming the problems of game software has moved beyond unreasonable. My son may like computer games, but I refuse to become a computer hobbyist to support his hobby.

*Steven Courcy
Westford, Massachusetts*

THE PERSONAL TOUCH

Thank you for Jim Seymour's column "On-Line Ties That Bind" (March 29, 1994) on ZiffNet member David Alsberg. Seymour touched my heart with a piece that was even better than usual. His column reminded me that on the Net or even its branch highways, we are truly a family. Though fractious, divided, and at times uncertain, we do value each other. Mr. Alsberg's death, a loss to all communities, was made all the more poignant, all the more real, with Seymour's eulogy. Though I did not know Mr. Alsberg, and had never read one of his posts, Seymour brought him to life and underscored the tragedy of his senseless death. Community of any sort

is at best a binding together, and Seymour has reminded us that we are bound best at the heart.

*Joseph Cejka
via the Internet*

HORRORS REVEALED

John C. Dvorak's column "The True Horror of Windows" (March 29, 1994) is perfectly titled. Microsoft Windows is a horror that has slyly encroached upon us as surely as the killer bee. Not so long ago it was just another gadget designed for the brain-dead who found DOS awesome and who should've had a Macintosh with pictures in the first place. The new gadget spawned new needs, including an ever-thicker manual and seminars to explain how to simplify Windows, not to mention the graphics accelerator boards, larger hard disks, and greater memory levels required just to load and effectively run Windows. Why do people love such pain?

*Harlan G. Koch
San Francisco, California*

Although Dvorak makes some interesting points in his column, his conclusion is off, particularly if the courts ensure Microsoft plays on a relatively level playing field. Device-independence means that small developers no longer need to maintain stables of programmers to write device drivers, which should increase competition, keep prices down, and allow them to concentrate on the heart of their programs. As to who should write the device drivers, one would think this would be something the OEMs would want to do themselves, rather than leaving it to third parties, since OEMs have a strong interest in ensuring that the drivers perform as efficiently as possible.

*Chris Brobeck
via the Internet*

Dvorak brought to light what I consider one of the great imperfections of Windows: the lack of support. I recently encountered the problem of drivers he discusses in his column when I upgraded from a DOS to a Windows version of an application. While driver availability and operat-

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LETTERS

ing system compatibility have both always been crucial, with Windows bundled into nearly every PC purchased, drivers have assumed a new degree of importance.

*Chuck Rohm
Mechanicville, New York*

SMALL WONDERS

Your review of subnotebooks ("Small Wonders," March 29, 1994) was interesting but disjointed in one respect. The Editors' Choice listing describes the winning Toshiba Portégé T3400CT as a "radical departure" that "redefines its category." Presumably, this sort of advance justifies a price tag roughly double that of its competitors.

Elsewhere in the roundup, the Price/Performance Index gives the Portégé a performance/features score of 129, barely edging out the Altima Traveler at 125 and the IBM ThinkPad 550 at 122. This strikes me as an excellent example of what is wrong with most computer reviews: A small performance improvement is described as revolutionary and is used to justify a hefty price increase, while the archaic, inferior competing products that cost half as much are downgraded.

*Bryan Scott Cox
via the Internet*

• **PC Magazine's Price/Performance Index measures physical attributes such as speed and price but not important intangibles such as service and reliability. The Portégé's performance was on a par with other machines reviewed, but it also included a color screen. The color option added significantly to the price, and this was reflected in the Portégé's placing in the Price/Performance Index. We revise the Price/Performance Index criteria from time to time to reflect changes in PCs and portables, and our issue of June 28, 1994, exhibits further refinements, specifically to give more weight to Microsoft Windows performance and additional features.—Ed.**

COMPILING COMPILERS

In your review of C++ compilers ("C++: New Package, New Power," March 29,

1994), you did an excellent job in the introduction and in the accompanying reviews of individual compilers. However, the selection of Microsoft Visual C++ as the Editors' Choice needs additional discussion.

The winner of a roundup should be head and shoulders above the competition in all areas of concern. However, while Visual C++ and Borland C++ have a great deal of overlap, there are major differences in the focus and thus the uses of the two products. Each of these products has its own place.

*Jeff Adams
Torrance, California*

ALWAYS ONE STEP AHEAD

I couldn't help smiling when I read the Trends article discussing smart cards ("The PC in Your Wallet," March 29, 1994) and the comment therein by National Semiconductor's Walt Curtis: "We've been able to get enough computer power and security into a semiconductor device. There are chemical, physical, and electronic devices that make our chip impenetrable." Would that it were so, but the unfortunate history of crime is that anything the mind of man devises, the mind of man can defeat. Isn't that what keeps antivirus programmers in business?

*Richard Thompson
Prince Frederick, Maryland*

TAB RIGHT ON ALONG

Jim Seymour describes the wonders of the tab metaphor ("Everything Old Is New Again," March 15, 1994), and I agree with him wholeheartedly! Even if the commands aren't located on each tab with the absolute maximum of logic, the concept makes it incredibly easy to "page" through the tabs. Not only that, but making dialog boxes available this easily makes taking care of multiple adjustments a cinch.

*Alan J. Vorel
Cedar Rapids, Iowa*

PATENTS STILL PENDING

In rebuttal to Michael J. Miller's column "Software Patents Must Go" (March 15, 1994): Of course computer programs are copyrightable. But copyrights protect only the expression of ideas, not the ideas themselves. Courts have consistently held that copyrights cannot pro-

tect concepts, principles and discoveries, processes, methods of operations, procedures, or systems. Therefore, copyrights will not protect the techniques used in an associated program or anything about the content of the program itself. An innovation is an innovation, and whether it's hardware or software, it all needs to be covered the same. The answer lies in taking more care when issuing patents. Patents propel technology, not hinder it, and one or two mistakenly issued patents are not reason enough to change the system.

*Scott Harris
Washington, D.C.*

CORRECTIONS AND AMPLIFICATIONS

The First Look of Hewlett-Packard's new HP DeskJets ("HP's New DeskJets: Evolution Steps in the Right Direction," April 12, 1994) notes the availability of an Adobe PostScript Level 2 upgrade for the DeskJet 560C; an upgrade is currently available only for the HP DeskWriter 560C.

The phone number for The Interactive Jobs Network (Trends, "Reshaping On-line Services," April 26, 1994) has changed. The new number is 415-247-7900.

The review of the Power Macintosh ("PowerPC Chip Helps New Macs Match Top PC," First Looks, April 26, 1994), should have stated that the Power Macintosh 7100/66 ships in a Quadra 650-style case.

HOW TO WRITE TO PC MAGAZINE

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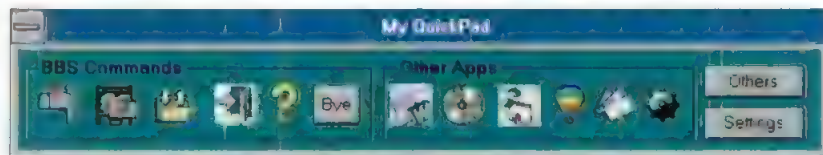
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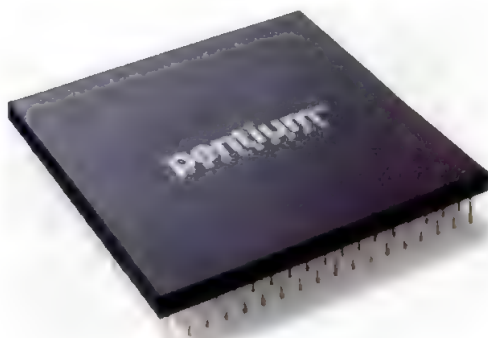
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course of
computing
is hereby
changed.

From the old.



(Actual size.)*

The chip on the left is getting a little old.

Its 15-year-old technology has been pushed to the limit. And while it worked well enough for yesterday's character-based computers, frankly, it's having a hard time keeping up with the demands of today's computers and software.

The new PowerPC[™] microprocessor from Motorola, on the other hand, is just getting started.

It's based on advanced RISC (reduced instruction set computing) technology, the technology most experts agree is the only way to reach the performance levels required by the new generation of computers and software.

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The PowerPC Microprocessor. *The RISC Chip.*

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2,300 known viruses, and our new Norton BackUp® 3.0 with enhanced support for SCSI drives. There's also the new UnErase, to recover accidentally erased files. Disk Doctor for automatic disk diagnosis and disk repair. And a Fix-It disk with a full collection of DOS utilities to recover and repair files or entire disks, even if you can't run Windows. And now for the first time, you'll be able to run Speed Disk under Windows to boost performance.

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So the choice is yours. Either see your local dealer, call 1-800-628-4777, ext. 9116 to order, or live a life full of danger and recklessness, running Windows without Norton Desktop 3.0 for Windows and sprinting around pools with sharp objects until you finally put somebody's eye out.

Of course, you would be absolutely crazy not to pick up your own copy of NDW 3.0 today. And remember, don't run Windows without it!

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CIRCLE 117 ON READER SERVICE CARD

Trends

TRENDS & TECHNOLOGY SHAPING THE PERSONAL COMPUTER MARKET



Audio Files

Setting higher standards for sound boards

When it comes to PC audio, the term "Sound Blaster-compatible" is a nebulous phrase that glues your PC's sound-making capability to the lowest common denominator. In 1988, Creative Labs set the Sound Blaster standard of 8-bit monaural audio that games

still use today. With the emergence of hardware that provides CD-quality 16-bit sound, the audio board business has been searching for a new standard. And the call has grown louder with the recent filing of some nasty lawsuits over Sound Blaster compatibility.

Out of the cacophony, the industry is hearing the trumpet-call for standards. VESA (the Video Electronics Standards Association), which cut its teeth establishing standards in graphics boards, has created the VESA BIOS Extension/Audio Interface (VBE/AI) and has opened it to all vendors who make audio hardware products such as chips and sound boards as well as to game and multimedia software vendors. VBE/AI has application programming interfaces (APIs) for both digital audio (.WAV) and MIDI files. Already, two audio chip set manufacturers, Media Vision and Sierra Semiconductor, have endorsed VBE/AI. The Media Vision Premium 3-D sound card is the first to use the standard.

Some vendors argue that VBE/AI may not be the answer. Bob Starr, vice president of marketing at Yamaha, says, "VBE/AI is too little, too late. We already have a standard for general MIDI." And since the primary architect of the spec was Media Vision, Starr feels Media Vision has too much of a vested interest in VBE/AI. Another shortcoming: VBE/AI has no provision for 32-bit protected-mode operation under DOS, although VESA promises an update.

Creative Labs intends to promote the Sound Blaster 16-bit specification as the follow-up to its 8-bit de facto standard. "The strongest way to insure the quality of audio is as an extension of [8-bit] Sound Blaster compatibility," said Arnold Waldstein, director of software product marketing at Creative Labs. "Sound Blaster compatibility" will be free to software developers, but Creative Labs will license its 16-bit spec for a fee to hardware manufacturers. VESA's spec is free.—*Christopher Barr*

Optical Disks Go Into Overdrive

PINNACLE MICRO, A SMALL COMPANY that championed magneto-optical technology as an alternative to traditional magnetic hard disks, is at it again. This time Pinnacle, based in Irvine, California, has developed a 5.2-gigabyte optical storage system that it claims is as fast as a hard disk.

Magneto-optical (MO) technology has certain advantages over traditional magnetic hard disks: One MO disk can store about 1.3GB of data, it's removable and portable, and it lasts over 20 years. These features make MO disks ideal for archival storage. When compared with ordinary hard disks, though, MO drives have always had slower disk access times and longer disk write times. These disadvantages made them less attractive than ordinary hard disks.

Pinnacle claims its Orray architecture overcomes many of the disadvantages of older MO technology. The Orray optical disk system consists of four removable 1.3GB MO disks in a single case with a SCSI-2 interface. Using a new controller design that's driven by a powerful RISC processor, Pinnacle's Orray can write to or read from two or four disks simultaneously at hard disk transfer rates. It uses up to 64MB of cache memory to assemble the data before writing simultaneously to all the disks. While the Orray system sounds like a RAID 0 setup, which does disk striping over multiple hard disks, Pinnacle is quick to say that Orray is unique because of its controller technology. An application-specific integrated circuit on the controller supports parallel processing; unlike a magnetic disk drive, circuitry for the analog-to-digital conversion is dedicated to each individual surface.

At \$14,995, the Orray magneto-optical disk system doesn't come cheap, but if you factor in using multiple sets of removable disks in each unit, the price per gigabyte quickly comes down: An extra 5.2GB of blank disks costs \$799. Pinnacle expects the Orray magneto-optical disk system to be used as video servers and database servers.—*Christopher Barr*

Pipeline *By Robin Raskin*

Rites of Spring

Spring's rebirth doesn't pass the computer industry by. Signs of rejuvenation and new beginnings are everywhere. Take Micrografx, for example. It used to be strictly a graphics software company. It was pretty good at the technology part of the business but not particularly good at business.

It didn't take long for new CEO Gordon Tucker to figure out that Micrografx's fulfillment process, for instance, had gotten wacky enough that the company was spending \$60 to ship out every \$20 software upgrade. Micrografx



called in a Price Waterhouse guy who happened to use ABC FlowCharter (a Micrografx product) to work his reengineering magic. Together, the Micrografx and PW folks reworked the flow. But they also reworked FlowCharter, attaching some formulas and analysis to the package. They found solutions to many of their

internal problems, the PW guy became a full-time Micrografx employee, and Micrografx is about to launch ABC ToolKit, a software product that embodies the TQM (Total Quality Management) principle. It even ships with a book on TQM training written by the ex-PWer.

The Micrografx folks are absolutely evangelical about this new venture. Ironically, one of the best gauges we have to see if the software works is to watch the company's bottom line.

Then there's Borland. These folks don't necessarily wait for springtime to change course, but they're seasonally correct for this one. Borland's latest strategic tool goes by the code name "VB Killer." It is a RAD (Rapid Application Development) tool that's based on Turbo Pascal, a high-performance, structural, object-oriented language. VB Killer is fully object-oriented so it can do cool things such as encapsulate legacy code or even Visual Basic controls and compile them. Because it's a full compiler, you spit out executables and DLLs. The program code and user interface are much more tightly knit than with VB and at first glance it seems as if you can write some impressive applications with amazingly few lines of code. This is an application with incredible potential. With luck, Borland can make it happen by the end of this year.

My winner of the "Let's Do Something Spring-like" contest goes to the IBVA (Interactive Brain Wave Analyzer), from IBVA Technology in New York City (212-754-4282). (IBVA is currently a Macintosh-only product; it will be ported to Windows soon.) The company is using a traditional biofeedback device as a computer input device. This is not particularly new idea. What's unique about it is the company's implementations. The first "work" is a video arcade-like car race where you are the driver. Only this time you need to relax and generate alpha waves in order to win the race. Tense up and you're stuck in place. The second work involves a movie in which the plot takes different twists depending on your anxiety level. Rewards for staying calm...now there's a springtime thought to get you through the Comdex season.

Robin Raskin is editor of PC Magazine.

Buy? Hold? Sell?

Wall Street's roller coaster ride this past March may have put you in a panic and left you wondering what your holdings are worth. You can get up-to-the-minute stock quotes by bothering your broker or by logging onto CompuServe or Prodigy. And chances are, your personal finance software already has a way to track stocks. As long as you have a modem, all the major personal finance packages such as Intuit's Quicken, MECA Software's Managing Your Money, and Microsoft Money have a method for getting stock quotes.

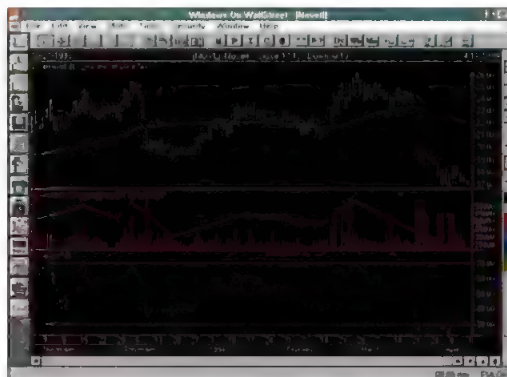
For analysis and deeper tracking you'll need more specialized software. Until recently, DOS-based software was your only choice, but a new generation of Windows software will make your task more graphical and easier to integrate with other applications. Windows on Wall Street, from MarketArts (214-783-6792), is a sophisticated analysis program that makes extensive use of charts to help you make buying and selling decisions. Windows on Wall Street can be automated to download data from a number

of on-line services such as CompuServe, Dial Data, and Dow Jones News/Retrieval, and then prepare the graphs.

Windows on Wall Street tracks stocks, bonds, commodities, mutual funds, and all of the major indexes. The charts it presents for technical analysis are based on accepted indicators used by Wall Street research firms. For instance, it will look at your stocks using anything from the Chaikin Oscillator to the Relative Strength Index. It even has a Stock Quick Pick view to assist the less sophisticated.

Reality Technologies' Reuters Money Network for Quicken Users (215-277-7600) is from the company that puts out WealthBuilder by Money Magazine. Reuters Money Network (RMN) extends the stock- and bond-tracking ability of Quicken by adding research databases and

historical pricing charts. RMN's on-line component, available at a monthly fee, dials into its own service and automatically retrieves price information and news stories that are fed into a newspaper-like interface (for more information on RMN, see First Looks, May 31, 1994).



Windows on Wall Street's view of Novell stock.

If you want to do some real-time stock trading, your broker may have a proprietary program that you can use. Charles Schwab's StreetSmart, which requires an account with Schwab, will track your stocks and bonds and let you place trade orders. If

you're a Fidelity customer, investigate Fidelity On-Line Xpress, which is still a DOS-based program, although a Windows version is in the works. Both programs will save you an extra ten percent on sales commissions—*Christopher Barr*

New Charge for Portable Power

BATTERY LIFE AND SIZE ARE THE biggest drags for power-hungry notebooks. And as new electronic devices arrive—from PDAs to smaller, more powerful cellular phones—the need for a new charge in portable power has become more apparent.

Bell Communications Research Corp.—commonly known as Bellcore—the technology center for the regional Bell operating companies, recently unveiled a possible solution. Its plastic rechargeable battery technology is lighter, more environmentally friendly, and possibly more powerful than

nickel cadmium or lead acid batteries.

Bellcore's lithium ion battery uses layers of plastic called a *polymer matrix* that contain the lithium-based oxide and carbon that react together to create power. It's a "rocking chair" battery, which describes the back-and-forth flow of lithium ions during its

ion battery is flexible and can be molded to fit the available space in a portable device.

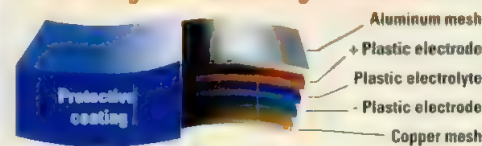
Bellcore claims its plastic battery has an energy density greater than that of nickel cadmium batteries, but weighs approximately half as much. In addition, Bellcore claims less "capacity fading"—the development of battery "memory," which reduces the effective charge over time—than other battery technologies.

The lithium ion battery doesn't use toxic elements such as lead, cadmium, mercury, and cobalt. Because the elements used are in a solid state, there's no chance that the battery can leak.

As a research consortium owned by the Baby Bells, Bellcore can't

market the technology it develops itself. A Bellcore spokesperson told *PC Magazine* that it has received a flurry of interest from a variety of electronics manufacturers and battery companies to license the technology, although no formal agreements have been announced.—Nate Zelnick

Five-Layer Battery Sandwich



Bellcore's lithium ion plastic battery can be shaped to fit inside a variety of consumer electronic devices such as notebooks, PDAs, and pagers.

Source: Bellcore

charge and discharge cycles.

Because the plastic battery doesn't contain liquid, it doesn't require weighty metal sheathing and is smaller and easier to integrate into a notebook case. Since the elements are bonded together and then covered with a moisture-proof coating, the lithium

Top Retail Software

Current ranking	Last issue	Product/company
1	—	MS-Office 4.2 Windows Upgrade Microsoft Corp.
2	—	MS-Office 4.2 Windows Microsoft Corp.
3	—	Prodigy Start-up Kit 1.0 for Windows Prodigy Services Company
4	1	MS Windows for Workgroups 3.11 Microsoft Corp.
5	5	WinFax PRO 4.0 Delrina Technology
6	4	WordPerfect 6.0 for DOS WordPerfect Corp.
7	8	Quattro Pro 5.0 for Windows Borland International
8	—	Lotus Improv 2.1 Lotus Development Corp.
9	7	QEMM 7.0 Quarterdeck Office Systems
10	3	Procomm Plus for Windows 1.02 Datastorm Technologies
11	14	Procomm Plus 2.01 Datastorm Technologies
12	—	Lotus 1-2-3 4.01 for Windows Upgrade and Lotus Organizer Lotus Development Corp.
13	—	MS Excel 5.0 for Windows Microsoft Corp.
14	—	MS Works 3.0 for Windows Microsoft Corp.
15	—	Expert Fonts Expert Software

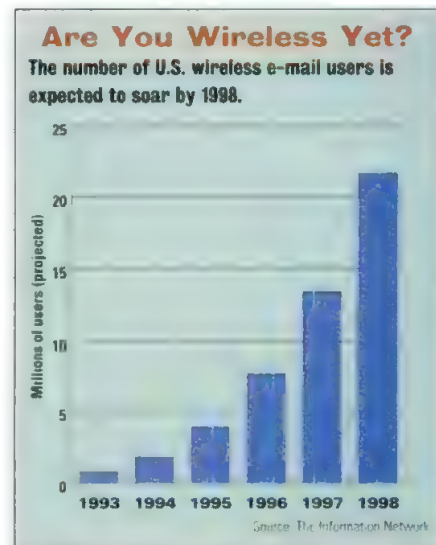
This list ranks PC business programs according to the total number of copies shipped to stores and resellers in the week ending April 9, 1993. The list is based on shipments to more than 12,000 retail locations. It does not include sales made directly by software publishers and cannot be interpreted as a picture of the entire software market. Sales information compiled by Ingram-Micro.

A Passport for Your PDA

IT MAY BE A SMALL WORLD thanks to global communications, but what happens when you take the PDA you purchased in New York on a business trip to Europe? Can you still send and receive wireless e-mail? Until there's a single wireless system that blankets the globe, the answer is no; you'd have to turn to more conventional means of wired communication. But soon you may be able to pack a PCMCIA wireless modem for each network you'll encounter.

Motorola is one company that is now developing country-specific PCMCIA wireless modems. One of the first PDAs to use the card will be AST's Gridpad, which uses Motorola's EMBARC NewsCard for wireless communications in the U.S. and Canada. By year's end, the Gridpad will offer "smart cards that are frequency-centric, capable of adjusting their frequency and wireless protocols on the fly," explains AST product manager Robert Brown. Apple is also preparing cards for its Newton MessagePad. By the end of this year, Apple expects to offer PCMCIA modems that will work with European digital wireless standards." When the communications device is solely on a PCMCIA card, it's as simple as pulling out one card and inserting another," says Louis Jouanny, vice president of international marketing at Fujitsu.

The obstacle to a global wireless network that lets you send and receive data is the pro-



liferation of incompatible cellular and radio frequency standards. Cellular phones encounter similar obstacles. For instance, the existing cellular networks in North America and many South American and Asian countries use AMPS (Advanced Mobile Phone Service), an analog cellular system running at 800 MHz. Meanwhile GSM (Global System for Mobiles) is a digital standard running at 900 MHz in parts of Europe. GSM is expected to unite Europe as well as parts of Asia and Australia by the end of 1995.—Melissa J. Perenson

Color Copiers Learn PostScript

CORPORATE COMPUTING JUST GOT a lot more colorful and affordable, thanks to a new generation of PostScript RIPs (raster image processors) that can turn digital color copiers into networked color printers. Traditional production methods make short-run color printing too expensive and too slow for many corporate projects. In contrast, print servers coupled with digital color



The ColorQ print server has calibration tools to get high-quality color from a digital copier.

copiers, such as the Canon CLC, the Kodak 1525, or the Xerox MajestiK, make short-run color printing economically viable.

Three big players in the PostScript interpreter market—Agfa Graphics Systems, ColorAge, and Electronics for Imaging (EFI)—have recently begun shipping print

servers that address the needs of corporate users. From the end user's point of view, there's only one important fact about the Agfa CR-A, ColorAge ColorQ, and EFI Fiery print servers: Once installed on an AppleTalk, Ethernet, or NetWare network, these products make that digital color copier that's locked up in the corporate copy center or isolated down the hall accessible through the Windows Print dialog box or as a Macintosh Chooser option. Simply stated, you can now produce high-quality (400- by 400-dpi), full-color (CMYK), large-format (11- by 17-inch) printouts on demand and in quantity (typical runs range from 100 to 500 copies).

From the corporate point of view, however, there are many issues to consider—price being the most obvious. Each product line now offers a lower-priced corporate model. The EFI Fiery 150i is \$28,500, while the original Fiery 200i server is \$37,500. ColorAge prices its models from \$19,995 to \$29,995, and the Agfa CR-A printers range in price from \$19,400 to \$35,700. Equally important is the machine's per-sheet cost. Because digital color copiers are plain-paper, high-volume machines (from 5 to 7.5 pages per minute), the cost per page can be as low as 10 to 25 cents or 30 to 50 cents including leasing and service contracts. Compare that to dye-sublimation printouts costing several dollars per page or to the 0.5-



page-per-minute speed of desktop ink jet color printers.

Andrew Borg of ColorAge points out that the most important feature of a color print server in the corporate environment is "not the lowest cost-per-copy, but the highest productivity per worker." Toward that end all three manufacturers include software for technically complex procedures such as linearization (which corrects for color drifts caused by humidity and temperature changes) and color calibration for consistent quality. Productivity enhancements include ColorQ's ability to appear as several virtual printers (where each one is configured with different resolutions or access privileges), and the Fiery 150i's ability to use the color copier as a scanner as well as a printer.—Luisa Simone

Briefs

SEATTLE HOSTS COMMUTE OF THE FUTURE.



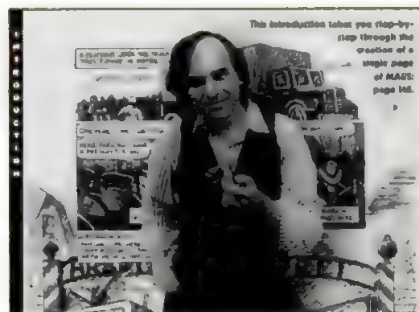
Instead of tuning in to radio stations for local traffic updates, Seattle residents will turn to PDAs and even wristwatches that contain the Advanced Communication and Timekeeping Technology (ACTT), an FM data receiver chip set developed by Seiko Telecommunication Systems. Seiko's High Speed Data System, a one-way wireless networking protocol, will transmit maps, transit schedules, real-time bus locations, ride-share information, and messaging. Seiko sees the technology as an inexpensive way of delivering all kinds of consumer information, including weather forecasts and sports scores.

THE MOST PROMISING NEW TECHNOLOGIES

are multimedia, expert systems, hand-held computers, and voice recognition, reports a survey of CIOs conducted by Deloitte and Touche. Those surveyed say today's most important enabling technologies for reengineering are communications and networking, client/server architecture, electronic data interchange, laptops, executive information systems, and imaging.

ART SPIEGELMAN'S PULITZER-PRIZE

winning graphic novel *Maus*, a memoir of his father's experiences during the Holocaust depicted in comic-book format, is now on CD-ROM. The Complete Maus (\$59.95), produced by The Voyager Co., juxtaposes the comics with original audio interviews of his father, rough sketches,



video commentary on the making of the book, and the entire contents of the original work, *Maus: A Survivor's Tale, Volumes 1 & 2*. Spiegelman says that he's working on future electronic projects. The Complete Maus is for the Macintosh only; Voyager expects to release a Windows version by the end of the year.—Carol Levin

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Blazing colors seem to sing. Images are vibrant and alive. For a crisp VGA backlit screen displaying up to 256 colors, the ColorNote employs dual scan technology—a breakthrough that achieves color comparable to that of a desktop color monitor yet is not as expensive as active matrix.



ZEOS dual scan screen (left) fires up rich, vibrant colors while standard passive matrix screen (right) produces faded and dull colors. Photos are not retouched.

What's more, it comes equipped with a PCMCIA slot, an internal floppy drive, built-in trackball and a Nickel-Metal Hydride battery. If your needs go beyond the standard scale, you can compose a personalized package with our many options. Let the ColorNote be the basis for your creative scores and presentations.

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- 8K internal cache.
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- Display: 640 x 480 dual scan color VGA backlit LCD, 9.4" diagonal, up to 256 colors.
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ColorNote 486: \$2395

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- 120MB IDE hard drive
- Microsoft DOS 6.2
- Microsoft Windows for Workgroups 3.11
- Lotus Organizer

PACKAGE 3

ColorNote 486: \$2695

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- 170MB IDE hard drive
- Custom nylon carrying case
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- Microsoft Windows for Workgroups 3.11
- Lotus Organizer

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- 486SL: 8K internal system cache.
- RAM expandable to 20MB (486SL) or 10MB (386SL).
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- 640 x 480 VGA backlit LCD display, 9.5" diagonal supporting up to 64 shades of gray.
- Unique tilt and swivel display.
- 256K (386SL) or 512K (486SL) video RAM.
- Supports an external SVGA color monitor with simultaneous display capability.
- Internal 3.5" 1.44MB floppy drive.
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- 486SL includes 3.3V technology for added battery life, and a built-in math coprocessor
- Replaceable and rechargeable NiCad battery.
- 81-key keyboard with built-in mouse key, "inverted T" cursor keys and dedicated Home, PgUp, PgDn, and End keys.
- AC adapter from AC110-240V to DC.
- Power-saving features.
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486SL-25: \$1495

Lease \$63/month

486SL-33: \$1695

Lease \$61/month

- 2MB RAM (386SL); 4MB RAM (486SL)
- 80MB IDE hard drive (386SL); 120MB IDE hard drive (486SL)
- MS-DOS 6.2

PACKAGE 2

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486SL-25: \$1795

Lease \$65/month

486SL-33: \$1995

Lease \$72/month

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- 120MB IDE hard drive (386SL); 180MB IDE hard drive (486SL)
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- MS-DOS 6.2
- Microsoft Windows for Workgroups 3.11

PACKAGE 3

386SL-25: \$1995

Lease \$72/month

486SL-25: \$2195

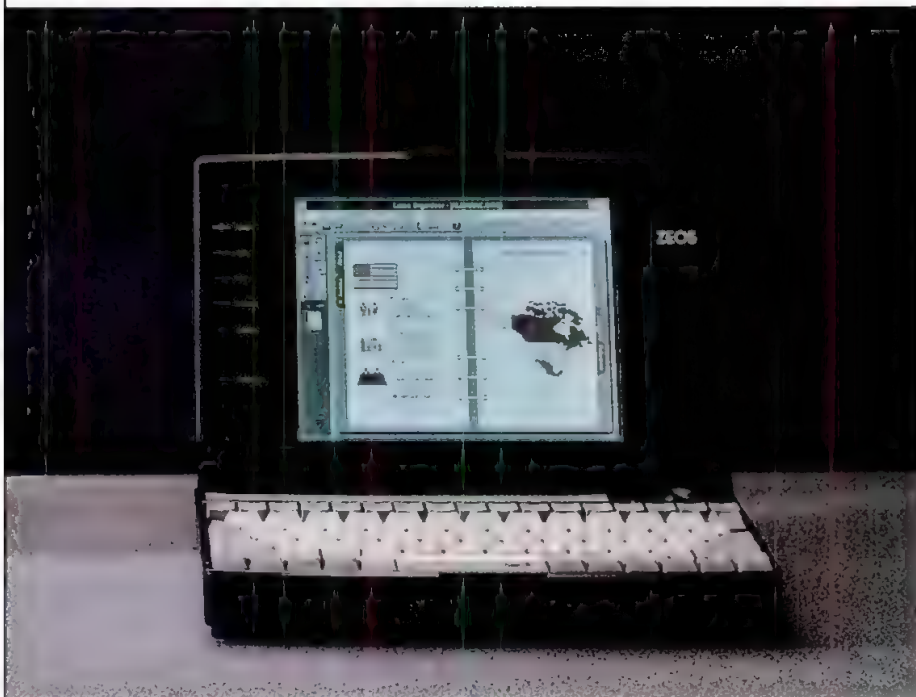
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486SL-33: \$2395

Lease \$87/month

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- 180MB IDE hard drive (386SL); 260MB IDE hard drive (486SL)
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- Extra battery
- External charging stand
- MS-DOS 6.2
- Microsoft Windows for Workgroups 3.11

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Lease \$61/month

- 4MB RAM
- 80MB IDE hard drive
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PACKAGE 3

386SL Contenda: \$1595

Lease \$58/month

486SL Contenda: \$1995

Lease \$72/month

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- 80MB IDE hard drive (386SL); 120MB IDE hard drive (486SL)
- External 3.5" floppy drive
- Custom nylon carrying case
- Extra battery
- Internal fax modem
- MS-DOS 6.2, Windows for Workgroups 3.11, Lotus Organizer

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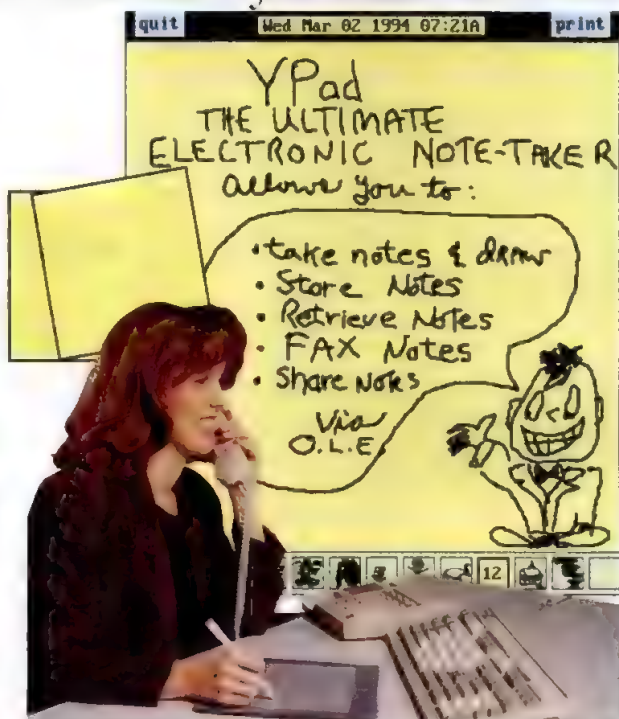
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March 1994, PC COMPUTING

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Gestures are special pen strokes that perform specific editing functions.

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First Looks

HANDS-ON REVIEWS OF NEW SHIPPING PRODUCTS

■ How to Connect Dots of Data

InfoCentral Can Pull Your Life Together

BY GREGG KEIZER

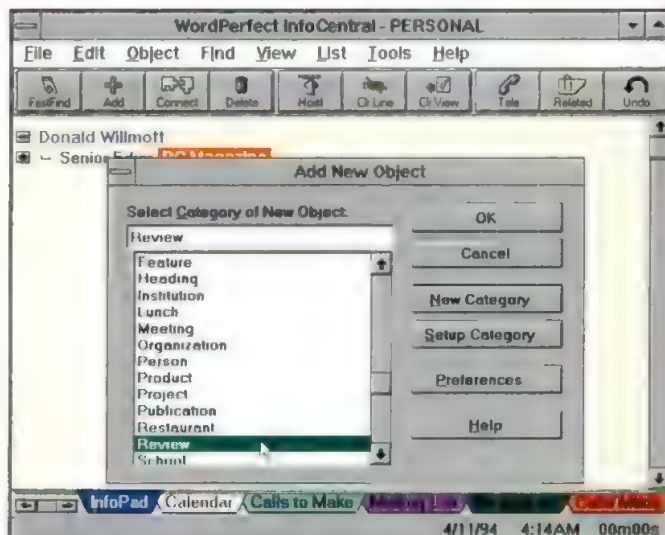
Most personal information managers may talk the talk, but when it comes to connecting diverse kinds of data, they rarely walk the walk. Keeping tabs on names and a daily calendar is child's play for any PIM, but collating other information—documents and images already on your hard disk, correspondence, disparate projects involving scores of people—is more easily written about on the back of the box than accomplished.

WordPerfect InfoCentral, a new \$139 PIM, may have more than a few rough spots (particularly its insufficient documentation), but its object-oriented approach to information management is rock-solid. It tracks your contacts and the work asso-

ciated with them equally well.

Like other recently released PIMs, such as CrossTies for Windows (First Looks, May 17, 1994) and Ecco Professional, InfoCentral regards information as objects. Each company or organization in the database, each person, each to-do item or phone call or meeting is represented as an object within InfoCentral.

By using objects, InfoCentral lets you recycle already entered information, connecting a person, for instance, to a company, a meeting, a project, and a to-do task without reentering the name. Central to this concept, and to this program, is object linking. You easily connect objects to show their relationship simply by dragging and dropping one atop another, tying a person to a company, a phone call to a contact, or a document to a project.



STEP 1: WordPerfect InfoCentral's object-oriented approach lets you relate information of all sorts.

INFORMATIVE CONNECTIONS

Unlike with other object-oriented PIMs, though, InfoCentral's connections themselves store information. When you link a person to a project as a participant, for example, that relationship contains the start and end dates of the individual's work.

InfoCentral typically displays its information in an outline for-

mat. Connecting lines show relationships; small buttons expand or contract the outline, and colors are available for emphasis. Other navigational commands include Hoist (which brings the selected object to the top of the outline), several variations of Clear (to remove objects from the screen), and Flatten (which

Continues on page 38

■ Laser Printers: The Next Generation HP's New LaserJets: 12 Pages per Minute at 600 dpi

BY EDWARD MENDELSON

Hewlett-Packard's new \$1,839 HP LaserJet 4 Plus produces the same 600-dot-per-inch laser output that the LaserJet 4 did, but does it 50 percent faster, needs less memory to do it, and saves toner and electricity along the way. HP's new desktop printer looks almost identical to the LaserJet 4 (it sells for exactly the same price as the earlier model), but it prints at 12 pages per

minute instead of the 8-ppm rate that has been the top speed of all of HP's desktop laser printers since the early 1980s.

HP has also released the PostScript-equipped HP LaserJet 4M Plus, which replaces the original LaserJet 4M. The \$2,479 4M Plus comes with Adobe's Level 2 PostScript in addition to the 4 Plus's standard PCL printer language, 6MB of RAM (as opposed to 2MB in the 4 Plus),



DESKTOP OR LAN: The LaserJet 4M Plus works well in both places.

and HP's JetDirect networking card. You can upgrade the new 4 Plus to the 4M Plus, but the original LaserJet 4 and 4M, with their 16-MHz processors, can't

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InfoCentral

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shifts all objects to the left and removes connective notations).

A toolbar and a context-sensitive pop-up menu that appears at a right mouse click hold the most common commands. Modem-equipped PCs can dial any of the phone numbers associated with an object.

LINKING DOCUMENTS

One of InfoCentral's most useful characteristics is the ease with which it lets you link documents to any object. The program will display a directory's files in the outline, letting you drag a file to the appropriate object for a connection; you can also access the File Manager and drag-and-drop items from there.

Connected files can, of course, be launched directly from InfoCentral. You can also create new documents with any Windows application and connect them to an object. InfoCentral provides templates for a handful of applications—for example, to create a letter in Microsoft Word for Windows.

Locating information in InfoCentral is a snap. Fast Find quickly locates and displays objects, often with just the bare minimum of typing. You can also search by example or by connection. The latter proves key to identifying comprehensive lists, such as all to-do tasks. Unfortunately, you can't save such searches for later reuse, a fault that makes many chores—accessing a complete count of all phone calls, for example—time-consuming.

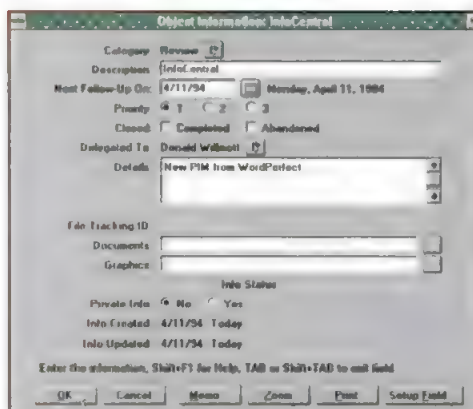
Each iBase, as InfoCentral calls a database, can have numerous discrete areas marked with file folder-style tabs. You customize these tabs to show, say, a list of your most important clients.

One tab holds a calendar that shows daily, weekly, and yearly (though no monthly) views of your schedule. You place events—appointments, meetings, and the like—on the calendar's user-set time slots by adding objects as you do in an outline. To-do items and notes are entered to the side in a separate section. But though you can prioritize tasks and set automatic follow-ups, you can't create recurring events or set alarms that ring more than 30 minutes prior to an event.

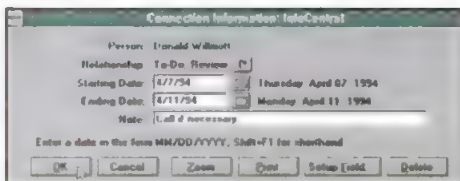
InfoCentral comes with a quartet of iBases that contain information on such wide-ranging subjects as travel, wine, consumer products, and even computer industry information. InfoCentral makes an excellent information manager for such precreated iBases. You cannot keep more than one iBase open at a time, however, so transferring information means using Windows' cut-and-paste maneuvers.

Other InfoCentral features of note include the ability to open multiple copies of an iBase, e-mail enabling, and four levels of password protection. Though InfoCentral isn't a true network package, you can "check out" a copy of an iBase to a notebook, then later reconcile your changes with those made

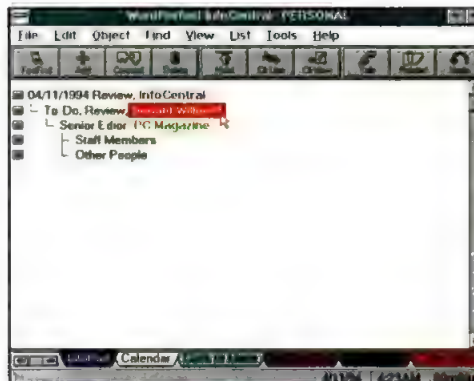
by someone else on the original database. InfoCentral sends files as message attachments via WordPerfect Office, or via VIM- or MAPI-compatible e-mail systems. In our testing, however, InfoCentral was unable to access Microsoft Mail (which supports MAPI). InfoCentral also acts as an OLE 2.0 client, so you can embed documents within an outline, then launch one with a single mouse click. And its



STEP 2: When you select a category, you'll see one of several different dialog boxes, depending on its type. This category, which is a Task, presents a box where you can set a follow-up reminder and prioritize to-do items.



STEP 3: In InfoCentral, connections contain information, too. Here, a customized to-do connection lets you note the start and end dates of the chore.



STEP 4: The result is a dynamic connection between the task and a person. You just expand the outline to see the relationship.

importation process and database housekeeping functions are both flexible and comprehensive.

InfoCentral does show some ragged edges in this first version.

You can't search the memos—notes that attach to virtually any object—nor the descriptions you enter to label documents and files you have connected. And although adding an object is relatively simple, it's all too easy to get confused by

the blizzard of dialog boxes that appear when you're connecting objects.

But the most glaring flaw of InfoCentral is its documentation. A skimpy 60-page booklet and the package's often terse on-line help are far from adequate, particularly for a program that deviates as far from the norm of PIM behavior as this does. The initial learning curve is not as steep as with something like Ecco Professional, but you'll have to uncover much of the program's power on your own. An on-line overview and several iBase templates help to some degree.

InfoCentral shows promise, and for its price it is an extremely

flexible and innovative program. In its current implementation and with insufficient help, however, InfoCentral is difficult to recommend for PIM beginners, who may be better served by something a little

bit simpler. And that's a shame, since InfoCentral really can walk the PIM walk.

► **WordPerfect InfoCentral.** List price: \$139. Requires: 4MB RAM, 4MB hard disk space, Microsoft Windows 3.1 or later. WordPerfect Corp., 1555 N. Technology Way, Orem, UT 84057; 800-225-5000, 801-225-5000; fax, 801-228-5377.

Circle 426 on reader service card



From May 31 through June 3, you can go on-line to discuss InfoCentral with Gregg Keizer and InfoCentral product manager Jim Tanner. Type GO EXEC from any CompuServe! prompt.

HP LaserJets

CONTINUED FROM PAGE 37

be upgraded to include the 12-ppm Canon engine and 25-MHz processor in the new models.

LEADERSHIP POSITION

The new models confirm HP's leadership of the desktop printer market and make fast networked printing available at a



PUSH HERE: HP keeps the printer controls simple and accessible.

lower price than ever before. The JetDirect networking card included with the 4M Plus has ports for Ethernet, Token-Ring, and LocalTalk connections, which supplement the built-in serial and high-speed parallel ports. The printer can be placed anywhere in the network, with no print server required; it accepts and queues print jobs from all ports simultaneously.

With an optional duplexing tray due in the fall (not yet priced), you'll be able to print automatically on both sides of the paper. The duplexing tray fits neatly under the printer and adds less than 3 inches at the back to the printer's 15.9- by 16.6-inch footprint—about the same depth needed for the connector on the parallel port.

Like the original LaserJet 4 and 4M, each of the new models enhances its 600-dpi output with HP's Resolution Enhancement Technology to gain a total effective resolution of 1,200 dpi. The new models use the same toner cartridge as the original and have the same 45 scalable PCL 5 fonts built in. The 4M Plus

comes with the standard 35 PostScript fonts built in. Both models have a slot for a single LaserJet-style font cartridge, and HP sells add-on fonts in the form of SIMMs that you plug into the same slots used for adding up to 62MB of RAM.

HP has reengineered the LaserJet 4 for better speed, superior paper handling, and improved memory management. Complex 600-dpi graphics that the original models couldn't print without extra memory now print perfectly. The new models also allow much more subtle gradations in gray-scale images than the originals.

A "PowerSave" setting puts the printers into standby mode after a specified idle period and restarts them when a print job arrives. You can also choose an optional draft mode that uses a fraction of the normal amount of toner.

SPEED TESTS

On PC Magazine Labs' tests, the 4M Plus performed at close to its 12-ppm rating: In either PCL 5 or PostScript mode, 300-dpi text printed at 11.3 ppm. In PCL 5 mode, 300-dpi graphics printed at 3.4 graphics pages per minute; in PostScript, 300-dpi graphics printed at 1.65 gppm. Informal testing at 600 dpi produced closely similar results, a tribute to the printer's fast processor.

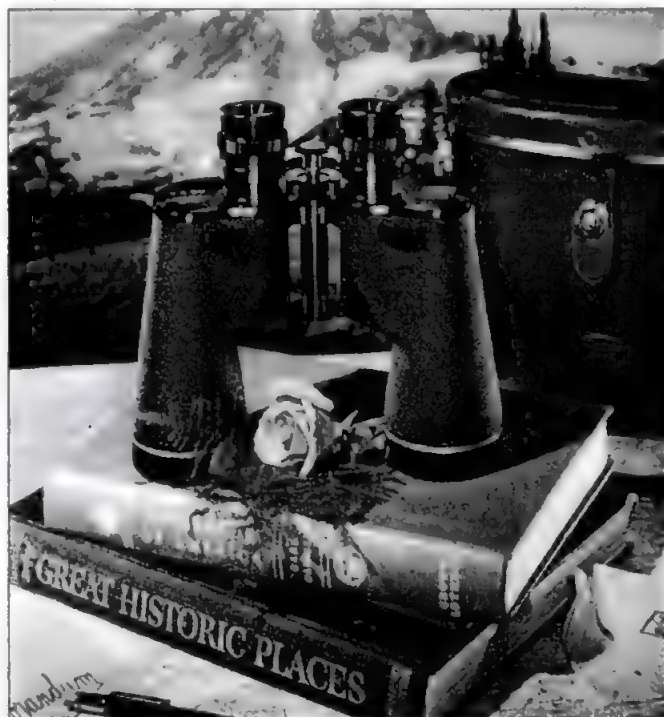
The new Windows printer driver for the 4 Plus works together with a status-display utility that warns you about error conditions at the printer and suggests solutions. (Similar drivers already ship with the less expensive LaserJet 4L and 4P models.) The printer also comes with DOS drivers for WordPerfect 5.x or 6.x, Lotus 1-2-3 2.3 or 2.4, and Harvard Graphics. It is fully compatible with other applications' drivers for the HP LaserJet III and original LaserJet 4.

The Windows PostScript driver that ships with the 4M Plus is Adobe's new Level 2 driver, with faster and more reliable performance than the driver that ships with Windows. When you use TrueType fonts with the new PostScript driver, the driver automatically sends the fonts to the printer in a special compressed format for increased speed. The original 4M model couldn't work with this format.

Each printer holds 250 sheets of paper in its main built-in tray and 100 sheets in a multipurpose tray that folds down from the



OUTPUT: At 300 dpi, PostScript images are fast (above). At 600 dpi, the images are razor-sharp (below).



front of the unit. An optional \$349 500-sheet add-on paper tray sits below the unit without increasing its footprint; an optional \$349 powered feeder for 70 envelopes fits on the front, and a \$389 output stacker for 1,000 sheets is also available.

The new HP LaserJet 4 Plus and 4M Plus models eliminate the minor annoyances of the models they replace. You no longer need to push a button on your printer to feed an envelope in PCL mode, and the various doors on the printers are easier to manage. Unfortunately, there's still no option for plugging in a hard disk for storing PostScript fonts. Except for this missing feature, the new models are the undisputed leaders in the desktop printer market—and the only desktop printers with the speed and flexibility required for workgroup printing.

► **HP LaserJet 4 Plus.** List price: \$1,839. **HP LaserJet 4M Plus.** List price: \$2,479. Hewlett-Packard Co., Direct Marketing Organization, P.O. Box 58059, Santa Clara, CA 95051; 800-752-0900, 208-323-2551; fax, 208-344-4809.

Circle 428 on reader service card

Databases

Access 2.0 Puts on a Friendlier Face

BY SAL RICCIARDI

When Microsoft first released Access in October 1992, it priced the program at \$99 and sold over a million copies in the first ten months.

Microsoft Access 2.0 for Windows (\$495; upgrade, \$99), improves on the first release in every way, coming closer than any other database product that we have seen to achieving a mix of features, power, and ease that's well suited to novices, developers, and everyone in between.

MAJOR OVERHAUL

Improvements are everywhere in Access 2.0. The most important new behind-the-scenes feature is engine-level data validation. When you supply validation rules for records and fields, they will be enforced globally, whether you change data in a form or in a datasheet by importing data from another source, by using an action query, by using a macro, or by using Access Basic, the Access programming language. This is a major change to Access's data integrity model and an important and welcome enhancement.

You can now create table relationships graphically instead of through the comparatively cumbersome two-at-a-time dialog box provided in the first release. You simply click on the toolbar's Relationships button. To create a relationship

between tables, you drag and drop a field from one table to the matching field in the other table and fill in the resulting dialog box.

You can tell Access to protect the referential integrity of each relationship, ensuring that the matching fields in related tables don't go out of sync with each other. For example, if deleting a customer will leave behind orphaned order records (with a customer ID that no longer exists), Access prevents the deletion. Similarly, you can't change a value in a primary table if that change results in orphaned records in a related table.

New to Version 2.0 is cascade support. You can tell Access to

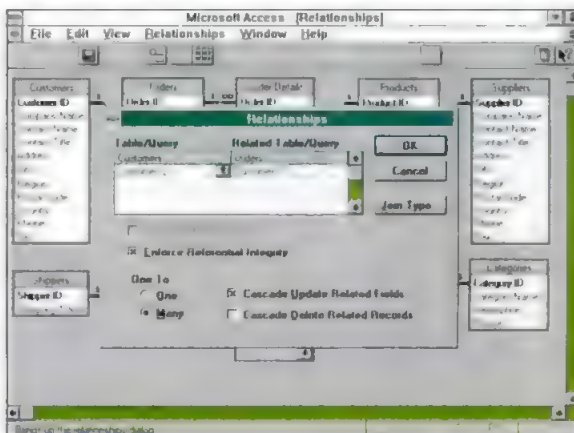
deleted, too. Similarly, the new cascade-update feature tells Access that changes to the primary key in a parent table should be made to all related child records.

One of Access's unique features is its ability to update the result of a query and have those changes propagated to the original tables. This feature, known as updateable view support, is

you a useful head start when creating new tables.

There are four different types of Query Wizards. The Find Duplicates Query Wizard, for example, helps you identify records that may contain duplicate information. First, you choose the table to check and then the fields where you want to look for duplicates. You can add any additional fields that

you want to be shown with the duplicates, and when you finish, Access generates the appropriate query, which you can name and save for reuse. There is also an Archive Records Query Wizard, a Crosstab Query Wizard, and a Find Unmatched Query Wizard.



DRAW AND DROP: To create relationships between tables, you simply drag and drop fields from one table to the other.

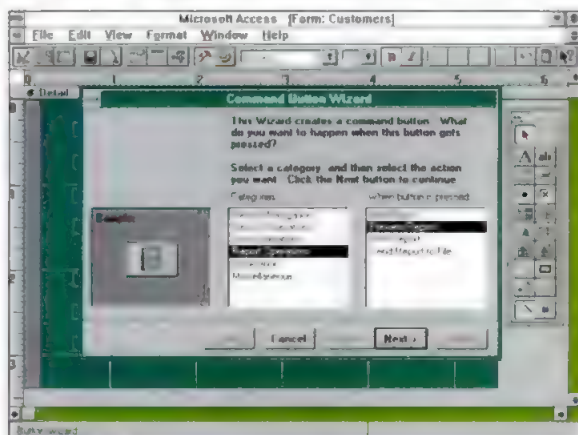
ADDRESSING EASE

Other ease-of-use features abound.

technically advanced and great to have. But while most query results are updateable, some are not. The new release enhances this feature by reducing the number of instances where a query result is not updateable.

Right-click on any object, and an appropriate shortcut menu appears. The new AutoForm and AutoReport toolbar buttons let you quickly generate click-of-the-mouse default forms and reports. A new quick-sort feature makes sorting your current datasheet or form view easier: You just click on the Sort-Up or Sort-Down buttons on the toolbar. If you're not sure what a certain toolbar button does, just leave the mouse cursor over the button and, as in the other Microsoft Office applications, a Tooltip pops up and gives a short description.

Users and developers alike will appreciate the new forms-design wizards. The Command Button Wizard makes creating buttons for your forms a snap. Not only can you choose from a variety of different graphics picture buttons, but the wizard automatically generates the code behind the button and attaches that code to the button's OnClick property. Similar



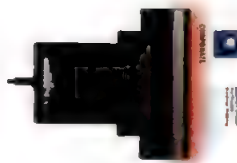
WIZARD: The Command Button Wizard automatically generates command buttons with attached Access Basic code.

A BLIZZARD OF WIZARDS

In the ease-of-use department, you'll find a veritable blizzard of wizards, handy tools that ask you a series of questions and then generate a database object based on your answers (there are 30 new wizards). The new Table Wizard lets you base a new table design on any one of nearly 50 different predefined table formats for common personal and business subjects, such as customers, orders, invoices, and the like. This gives

cascade deletions instead of preventing them. This means that if you delete a customer record when matching order records exist, the order records will be

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For Your Information.

CIRCLE 097 ON READER SERVICE CARD

First Looks

wizards are available for creating option groups, list boxes, combo boxes, and graphs.

PROPERTY ENHANCEMENTS

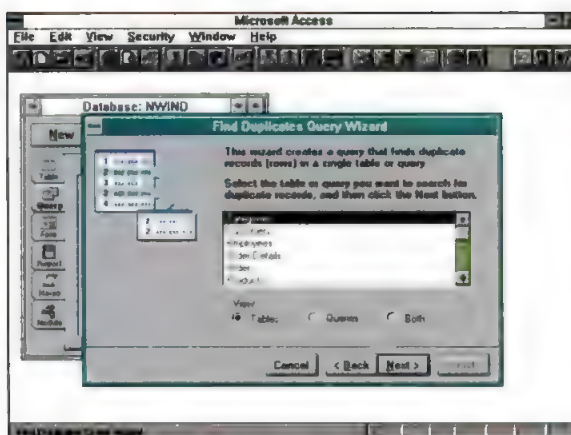
Access's property sheets are now easier to use thanks to a variety of builders that you call up with a builder button attached to the property box. You narrow the sometimes-unwieldy list of properties by choosing to view only those belonging to a specific category. You can also select more than one control on a form or a report and set common properties for all of the selected controls at once (for example, setting the font property for a number of selected text controls). If you've grown tired of switching from forms and reports to the container window in order to call up a macro or a procedure, you'll be pleased to learn that you now get at macros or procedures directly

through the event property to which they're attached.

RUSHMORE OPTIMIZATION

Microsoft has been talking for quite some time about sharing technology between Access and FoxPro. Access 2.0 is the first of the two to benefit from this cooperation; it now has FoxPro's data-access technique, Rushmore. If FoxPro is any indicator, Rushmore will have a dramatic impact on Access's performance in situations where it can be employed.

Also new to Version 2.0 are union queries, data definition queries, a custom menu builder, a Microsoft Word for Windows



DOUBLE PLAY: You can use the Find Duplicates Query Wizard to locate records that are possible duplicates.

MailMerge Wizard, a Graph Wizard, customizable toolbars, support for subqueries, and more. Still missing, however, is support for name-change propagation. If you rename a field, you still have to open up every form, report, macro, module,

(8MB recommended), 6MB hard disk space, Microsoft Windows 3.1 or later. Microsoft Corp., One Microsoft Way, Redmond, WA 98052; 800-426-9400, 206-882-8080 fax, 206-936-7329.

Circle 433 on reader service card

Type

Type Twister Makes Text Shout

BY TIN ALBANO

You don't need to be a newsletter editor or a desktop publishing fanatic to make good use of Aldus Corp.'s Type Twister 1.0 for Windows (\$49.95). This fun to use package makes it easy to spruce up words for letterheads, invitations, banners, flyers, signs, and anything else you need to liven up.

Although both Microsoft Word for Windows and WordPerfect 6 for Windows have built-in text editing utilities (WordArt and TextArt, respectively), they're not as versatile as this clever utility.

The success of Type Twister lies not so much in the many special effects it lets you choose from, but in its ease of use. There's almost no learning curve; after a brief installation, you're ready to go.

Just because Type Twister is easy to use, that doesn't mean it's simplistic. On the contrary, you get 50 preset color designs and you can add another 50 original designs. These designs determine the type of effect that will enhance the text you've chosen, making the words curve, bubble, layer, spiral, or even throw shadows. After you've picked a desired effect, you can manipulate the text by squeezing or pulling it any way you want.

In Type Twister's control window, you type the word (or words) you want to enhance. Then you just click on a design and watch the preview window to see the design take effect. Choosing another design icon changes the effect on the word so quickly that you can easily scroll through multiple designs until you find the perfect effect.

With the mouse, you can



WORD TWISTER: Type Twister lets you quickly scroll through different effects.

manipulate the word in the preview window, changing its shape, font, size, color, and angle of rotation. If you find that you've created a particularly interesting effect, you can save it. An icon with a sample of your effect is instantly added to the toolbar. When you're done, you can save the enhanced text to the Clipboard and from there, paste it into almost any Windows app.

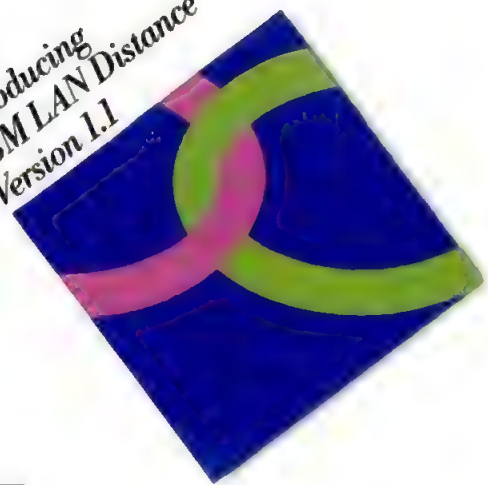
At about \$30 on the street,

Type Twister is a bargain. It's the easiest tool we've seen so far for making your words twist and shout off the page.

► **Type Twister 1.0 for Windows.** List price: \$49.95. Requires: 2MB RAM, 2MB hard disk space, Microsoft Windows 3.1 or later. Aldus Corp., 5120 Shoreham Pl., San Diego, CA 92122; 800-888-6293, 619-558-6000.

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jack.

How they compare:	IBM LAN Distance	DCA Remote LAN Node	Shiva LANRover	Novell NetWare Connect
Connectivity Options				
Remote to LAN	Yes	Yes	Yes	Yes
Remote to Remote	Yes	No	No	No
LAN to Remote	Yes	No	No	Yes
LAN to LAN	Yes	No	No	Yes
Remote Connectivity				
Sync, ISDN, X.25 (In addition to ASYNC)	Yes	No	No	Yes
LAN Application Interfaces				
NetBIOS, NetBEUI, BQ2.2 (In addition to IP and IPX)	Yes	Yes	Yes	No
Security				
WS Addr., Sec. Admin., Logon Policies, Logon Day/Time (In addition to User ID, Password and Callback)	Yes	No	No	No

■ PCs

275 MHz: Carrera's Cobra Features New Alpha CPU

BY DAVID WILSON

Carrera Computers immodestly claims that its Cobra AXP 275 is the "world's fastest RISC PC," and in fact the claim is true in some areas of performance. Even so, in an era of rapidly increasing PC performance, a claim of being the "fastest" leaves out all the interesting details.

Depending on what kind of applications you use, the Cobra is either as fast as a superfast Pentium or as slow as a 386 system. It is the fastest RISC PC today, but only in its native mode.

The Cobra is based on Digital Equipment Corp.'s Alpha processor. The 21064A version in the Cobra runs at an impressive 275-MHz clock speed—the fastest found in any commonly used microprocessor today.

The Cobra's processor has a RISC design that executes Digital's Alpha instruction set. On the chip is 32K of cache, 16K each for instructions and data.

LIKE A PC

The system built around the processor has some PC-like specifications. There are three 16-bit ISA expansion slots, two PCI local-bus expansion slots, and nine internal half-height bays in the tower design. The motherboard has embedded SCSI-2 and Ethernet ports and one parallel and two serial ports.

To support the processor's clock speed, the memory and processor buses are 128 bits wide, the maximum path width supported by the Alpha chip. The system we evaluated had 64MB of RAM.

The key performance factor for RISC machines is keeping

the processor busy executing instructions. So in addition to the 32K of cache in the processor, the Cobra has 2MB of fast secondary cache acting as a buffer between the processor and primary memory.

The system comes with Microsoft Windows NT for the Alpha, and using the system is just like using any other Windows NT system. Even the transition from Windows 3.1 to Windows NT seems easy and natural.

NATIVE MODE AND EMULATION

What's the effect of using this very fast hardware with Windows NT? That depends on what kind of programs you run.

Windows NT provides both a native Alpha mode and a DOS-emulation mode. When you load an app, the system decides whether the code is Alpha- or DOS-based and then starts the emulator if necessary.

During testing, the system ran well in its native Alpha mode. Everything worked as expected,

and it performed better than any other NT system we've tested. Although we have no complaints about the Cobra's operation under Windows NT (which was as good and as fast as we've seen), it's interesting to note that an equivalent Digital system run-

each was running the same application compiled in its native mode. By contrast, when emulating DOS in order to run PC Labs' benchmark tests, the Cobra took three times as long as a 66-MHz Pentium-based system. The Cobra's performance was similar to that of a 50-MHz 486-based PC on our processor tests, but its floating-point performance was at a lower level, about that of a 25-MHz 386-based system. The Cobra's hard disk performance was very good, in part because Windows NT does disk caching by default.



ning OSF Unix would offer a little more performance because of better compilers and higher optimization with the OSF Unix compilers.

HOW FAST IS FAST?

Performance testing showed the Cobra to be typically three to four times as fast as a 66-MHz Pentium-based system when

MEGA MEGAHERTZ: Cobra systems cost from \$7,995 to \$13,995.

The Cobra AXP 275 ranges in price from \$7,995 to \$13,995, depending on the RAM (16MB to 64MB) and hard disk space (250MB to 2GB). All systems come with a CD-ROM drive, a monitor, and a mouse.

This pricing makes the Cobra more expensive than most PCs, and there's no reason to consider it if you use only DOS and Windows apps. But for a Windows NT user whose apps are available for the Alpha, the Cobra makes sense. In that scenario, it really is the fastest Windows NT machine around today.

► **Cobra AXP 275.** List price: \$8,000 to \$14,000. Carrera Computers Inc., 23181 Verdugo Dr., #105A, Laguna Hills, CA 92653; 800-576-7472, 714-707-5051; fax, 714-707-5053.

Circle 435 on reader service card

■ DOS Emulation Woes

DOS emulation isn't easy. We've tested Microsoft Windows NT on several RISC architectures and on many Intel processors in a number of different systems, and we've been able to get through PC Labs' DOS-based benchmark tests only once. Apps running under DOS emulation on the Cobra AXP 275 crashed intermittently, and one benchmark test always crashed it. The same test ran fine on any standard DOS-based PC we tried.

This is certainly not a condemnation of the Cobra alone. Other NT systems have shown similar behavior, failing on different DOS-based tests. We advise strong caution when using DOS-emulation facilities. Hard-earned experience continues to show that DOS programs won't always run smoothly on a Windows NT-based system.—DW

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CIRCLE 228 ON READER SERVICE CARD

ADL

■ Multimedia Utilities

CD Essentials: Helpful, But a Little Remote

BY DAVID HASKIN

CD Essentials is a unique collection of CD-ROM and multimedia utilities that include tools for cataloging CD-ROM collections and simplifying the loading of disks. While useful, this \$49.95 package from Phoenix Technologies suffers from an odd interface and flimsy documentation.

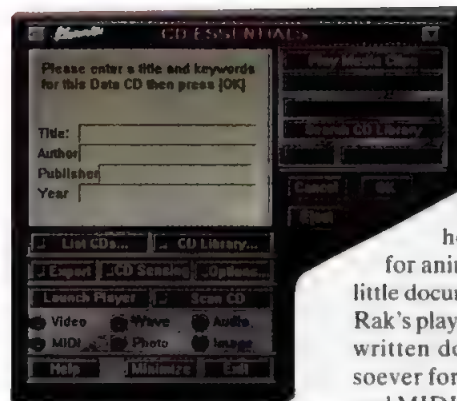
At the heart of CD Essentials is a program control window that looks like a familiar handheld remote control gadget but is actually an unfamiliar and sometimes confusing interface. You use this window to create, search, and view a database of all the disks in your CD-ROM collection.

CD Essentials constantly scans your CD-ROM drive and cleverly senses whether you've

registered the disk with your CD-ROM database. If you haven't yet installed the disk, CD Essentials walks you through both the installation and database registration processes.

When CD Essentials detects a registered disk in your CD-ROM drive, you're given several loading options to choose from. With one option, CD Essentials asks if you want to load the disk or another program. A more powerful option automatically loads the disk upon detection, a great feature for beginners and those who frequently switch disks.

Unfortunately, automating the disk-loading process requires that you manually collect and provide the name of the disk's primary executable file, a task for which CD Essentials provides no help. You also must get into the habit of removing disks set for automatic



INTERFACE: *CD Essentials looks like a familiar remote-control device, but it can be confusing to use.*

loading from your CD-ROM drive when you finish with them. Otherwise, CD Essentials automatically loads the disks upon startup, even if that's not what you had in mind.

Another option is to have CD Essentials automatically load MediaRak, its collection of players for sound, images, and video. The media players are competent and look great. The

audio portion, for example, looks like a stereo component rack, and the image viewer supports an impressive number of graphics formats. Missing,

however, is a player for animation; also, there is little documentation for MediaRak's players and absolutely no written documentation whatsoever for MediaRak's .WAV and MIDI sound-editing capabilities.

CD-ROM collectors will appreciate CD Essentials' database and its ability to automate the disk-loading process, but its odd interface and skimpy documentation still need work.

► **CD Essentials.** List price: \$49.95. Requires: 4MB RAM, 4MB hard disk space, CD-ROM drive, Microsoft Windows 3.1 or later. Phoenix Technologies Ltd., 846 University Ave., Norwood, MA 02062; 800-452-0120, 617-551-4000; fax, 617-551-3725.

Circle 427 on reader service card

■ Windows Utilities

SideBar Drags and Drops In Two Directions

BY BARRY SIMON

While the design of Quarterdeck's SideBar shows promise, none of the features in this \$59.95 Windows utility are spectacularly new enough to make it stand out in an ever-growing crowd.

Like so many other programs, SideBar replaces or supplements Windows' File Manager and Program Manager. Its trademark element is a narrow bar—that by default runs down the right side of the screen. The bar displays raised icons that represent folders, launchable programs, and associated files, drives, task lists, a clock, a File Run dialog, a

preferences dialog, and a trash can called the Recycler.

You move objects from the sidebar, from a launch folder, or from a drive window and place them on the desktop in the manner pioneered by The Norton Desktop for Windows. Going

beyond the Norton metaphor, you can also move objects back to the sidebar. So, for example, you can drag a .TXT file from a drive window either to the desktop or to the sidebar and have the Windows Notepad open that file when you double-click on it.

When you double-click on a drive icon, you get a file listing and a tree display, and the sidebar and drive windows can each have a status bar displaying free memory and resources. Either can also display what the program erroneously calls a toolbar. It is actually a command line from which you can issue DOS commands or launch Windows apps.

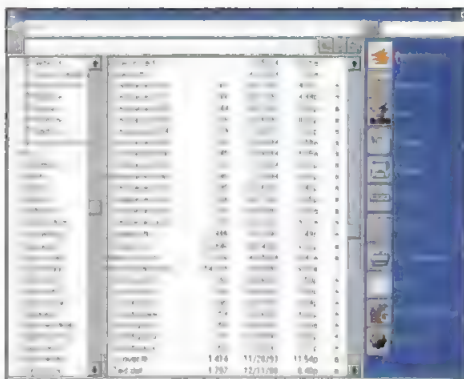
Unfortunately, some of the objects are underpowered or limited. The clock doesn't have a digital display, the file manager offers little beyond Windows' own File Manager, there is no .ZIP file

support, and there are no file viewers, although the status bar will display the start of the first line of a text file.

Despite its name, the Recycler is just a dumb trash can with no undelete abilities. While you can recall previous command lines with up arrow, the program keeps no memory of earlier Run commands. There's no way to configure an icon to use an existing instance of an application, so it's possible to run multiple copies of applications in error.

SideBar's framework is attractive and its potential is substantial, but for now, you'll be better served by one of several popular alternatives in this very crowded market.

► **SideBar.** List price: \$59.95. Requires: 256K RAM, Microsoft Windows 3.1 or later. Quarterdeck Office Systems, 150 Pico Blvd., Santa Monica, CA 90405; 310-392-9851; fax, 310-314-4218. Circle 424 on reader service card



ICON DO IT: *SideBar stays out of the way.*

Forms

JetForm Continues to Lead the Paperless Office Crusade

BY ALFRED POOR

The paperless office still remains an elusive grail, but JetForm Corp. makes a valiant effort in its quest. JetForm 4.0 provides a series of tools that you can use to assemble a formidable system for creating and managing electronic form-based information. The product continues to be an association of separate modules, each with new features and functions—including OLE 2.0 support—not found in Version 3.1 (reviewed in "Filling [in the] Blanks," March 29, 1994).

DESIGN A FORM...

The key component is JetForm Design 4.0 (\$495), a Windows-based application used to create electronic forms. The new version adds some useful tools, including a Table tool that makes it easy to define a ruled grid of rows and columns. One of the most important additions is direct support for most of the major database file formats (including .DBF, Paradox, and SQL), along with the ability to link to a different database for relational data structures.

Another major improvement in the Design module is a dictionary of forms and form components that makes it possible to track all the forms that use a given element (such as a company logo or address). When that element changes, you can automatically update all form designs that use that element.

The Design module still has some shortcomings, but they're minor. For example, bitmapped graphics on forms (called "logos") can only be one color. In the previous version logos could only be black, so having any color at all in your logos is something of an improvement, though not a great one. There also is no gradient fill feature. Aside from these limitations, however, you should be able to recreate just about any existing paper form.

...FILL IT...

The \$149 module JetForm Filler 4.0, which comes in different versions for different platforms (including DOS, Windows, and Macintosh), has a handy new feature that allows forms to be designed so that an appropriate view is presented to the user based on that user's role. As a result, someone who is review-

ing a form for approval can be shown just the summary information, and it's easy to hide fields from users who don't need to see them.

You can also design forms with Action Buttons that can call up additional detail at the user's request, and the JetNotes feature lets a user add free-form text annotations to a form before sending it along to the next person on the routing list. The Filler module supports routing of forms using LAN e-mail systems, including Lotus cc:Mail,

currently in process. Users can search this database on a range of criteria including originator, status, and date sent.

The Fax Director is a server-based fax utility that makes it possible for many users to share a single fax modem and telephone line. This shared access also reduces the length of time that a user's workstation is tied up for a fax transmission. You can also specify where the various pages of multiple-page forms are sent.

The Distribution Director

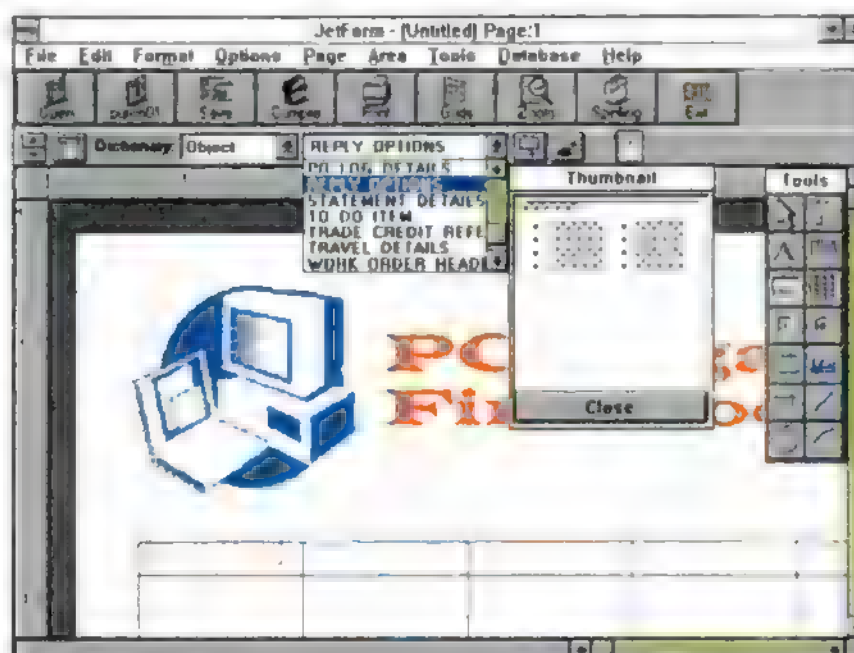
will be of great interest to forms designers who must support a wide number of forms in a multiuser environment. Since JetForm now supports local- and wide-area network installations, it can be difficult to update all forms when an element changes (for example, the company address). The Distribution Director uses the information that is stored in the forms dictionary

database (maintained by the Design module) to send copies of updated and recompiled form definitions to all users, anywhere in the system.

JetForm won't get rid of all the paper in your office, but if you need to send information—and track it—across the hall or to branch offices around the country, and you want the flexibility to print, fax, or e-mail your forms to their destination, JetForm gives you the tools to make all this work.

► **List price: JetForm Design 4.0, \$495. JetForm Filler 4.0, \$149; 5-user pack, \$595. JetForm Server 4.0: 5 users, \$795; 20 users, \$1,695. Requires: 2MB RAM, 5MB hard disk space, Microsoft Windows 3.1 or later. JetForm Corp., Watermill Center, 800 South St., #305, Waltham, MA 02154; 800-538-3676, 617-647-7700; fax, 617-647-4121.**

Circle 401 on reader service card



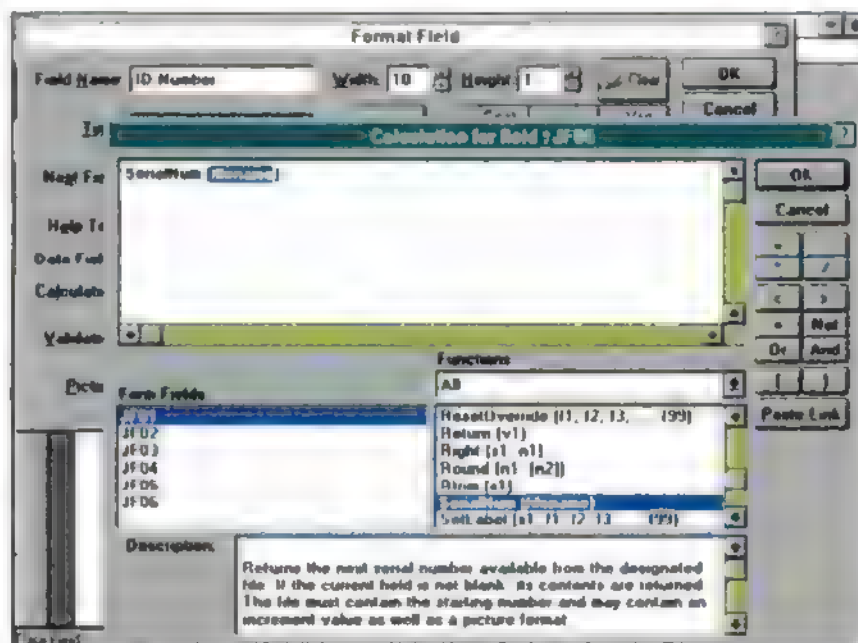
MIX AND MATCH: Building new forms is easy because you get access to fields and form elements that have been stored in the forms dictionary.

Lotus Notes Mail, or Microsoft Mail.

...AND SEND IT ON ITS WAY

The module JetForm Server 4.0 (\$795 for five users) continues to provide powerful print server functions, making it possible to send different pages of a form to different printers on a network. JetForm now offers three optional add-on modules to Server that can add important power to an installation: the Tracking Director, the Fax Director, and the Distribution Director (each \$495 per server).

The Tracking Director works with the Filler's routing features to maintain a database of all forms



JETFORM DESIGN: There are many field definition features for you to use, including a powerful collection of calculation functions.

Word Processing

Word for Windows Add-Ins Focus on File Management

BY EDWARD MENDELSON

Microsoft built Word for Windows with an open architecture, in which every command or function could be enhanced or replaced by user-written macros or third-party software. Three major add-in packages—MasterWord, MegaWord, and WOPR—have now appeared in the wake of Word for Windows 6.0. All enhance Word's file management, graphical interface, and other features. It's no surprise that all three offer file managers that give Word the named directories and many other file-handling conveniences normally found only in WordPerfect for Windows.

MASTERWORD 6.0

The most technically advanced of the three add-in packages is Alki Software's \$99.95 MasterWord 6.0, which is built from high-speed programming code instead of slow WordBasic. Its best features are its "wizards," which automate the use of otherwise time-consuming Word features such as watermarks, fractions, headers, and window management. Unlike Word's own built-in wizards, these include preview screens.

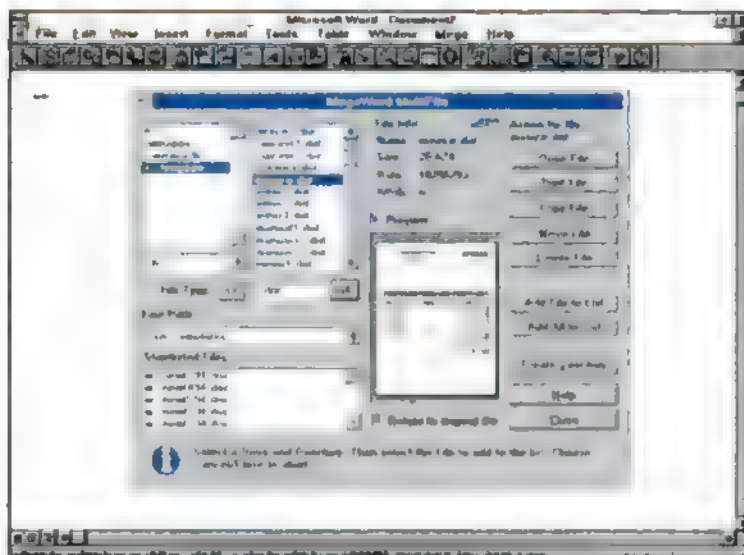
MasterWord integrates a highly detailed supplementary help file with Word's built-in help and lets you set the skill level of the help that it displays. A "Command Central" lists all of Word's commands, with help screens about each. In a feature borrowed from WordPerfect,

MasterWord lets you replace Word's pictorial toolbar icons with icons that have explanatory labels.

MasterWord doesn't insert itself into Word's native menus but instead attaches its menu button to the program's title bar. Unfortunately, the menu that drops down from this button fails to recognize keyboard shortcuts. You can create named directories, but access to these directories is more awkward than in the corresponding features found in WOPR and MegaWord.

► **MasterWord 6.0.** List price: \$99.95. Requires: Word for Windows 6.0 or later. Alki Software Corp., 300 Queen Anne Ave. N., #410, Seattle, WA 98109; 800-669-9673, 206-286-2600; fax, 206-286-2785.

Circle 421 on reader service card

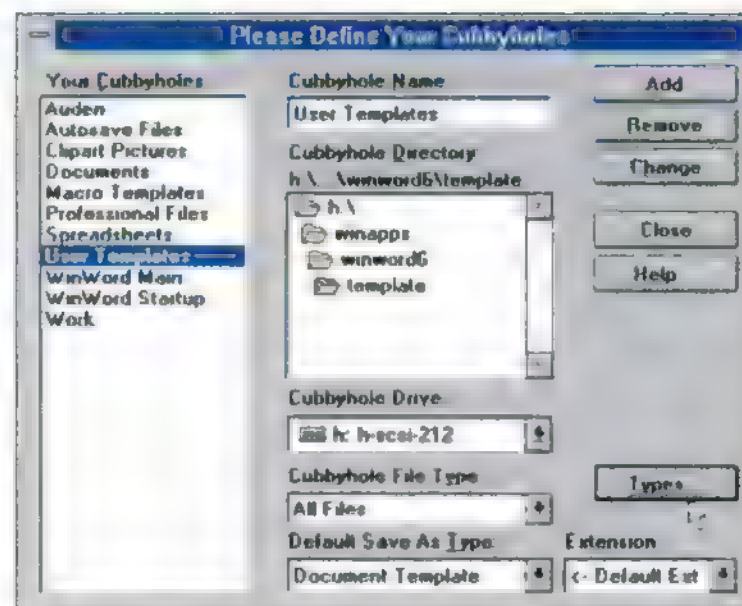


MULTIFILE: MegaWord lets you manage multiple files from a single menu.

MEGAWORD 6.0

Like other add-ins, MegaWord 6.0 (\$49) lets you create named directories for fast access to sets of files located in various places on your disk. A multifile manager lets you work with files from different directories at the same time. A project manager lets you save named sets of files and reopen them all with a single command, and a document

recall feature lets you preview up to 20 recently used files. You can delete files from most MegaWord menus that let you



CUBBYHOLES: WOPR's file manager includes named directories and displays Word's document summaries.

view or select files.

MegaWord lets you custom-design sets of display options for the exact combination of scrollbars and other features that you want on-screen and switch instantly among option sets. A document browser lets you move through thumbnail views of long documents to find the page you want to edit. An enhanced print menu lets you define default printers and fax drivers, then choose to print to one or both by clicking on checkboxes.

Other features include 3-D effects in tables, calendars that you can paste into files, a tightly integrated calculator, and an application launcher that runs as a menu or toolbar. MegaWord is often not as intuitive to use as MasterWord or WOPR and is often slower, but it offers the richest set of unique functions available in any add-in for Word.

► **MegaWord 6.0.** List price: \$49. Requires: Word for Windows 6.0 or later. Merlot International; distributed by

Advanced Support Group, 11900 Grant Pl., Des Peres, MO 63131; 800-788-0787, 314-965-5630; fax, 314-966-1833.
Circle 422 on reader service card

WOPR 6.0

Pinecliffe International's \$49.95 WOPR 6.0 is a collection of loosely related utilities instead of a single integrated system, so you can easily install only those features that you need.

The name of the package stands for Woody's Office Power Pack, and the macros that are included were written or collected by the legendary WordBasic programmer Woody Leonhard.

WOPR's main features include the best file manager available for Word; an envelope printer that's more reliable and

more flexible than Word's built-in counterpart; a toolbar editor; an awkward-looking pop-up speller; and miscellaneous macros that add crucial convenience features to Word.

WOPR file manager uses named directories, but with the added convenience that you can set a default file type for documents that you save to individual directories. This means that when you use WOPR's Save As menu to save to a named directory, your file can automatically be converted into ASCII, Word 2.0, or any other format supported by Word.

Despite some minor glitches, the splendid file manager and the macros make WOPR an essential purchase.

► **WOPR 6.0.** List price: \$49.95 (plus shipping). Requires: Word for Windows 6.0 or later. Pinecliffe International; distributed by Advanced Support Group, 11900 Grant Pl., Des Peres, MO 63131; 800-659-4696, 314-965-5630; fax, 314-966-1833.

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April 12, 1994



May 1994

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- 14" SVGA color monitor, .28mm dot pitch
- DOS, Windows for Workgroups, Mouse
- Choice of Lotus application

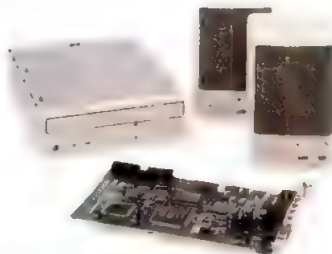


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Electronic Mail

cc:Mail Mobile for Windows Improves Remote Access

BY MITT JONES

Travelers intent on keeping up with the cc:Mail chatter back at the office but frustrated by cc:Mail Remote for MS-DOS will be happy to learn that they can now migrate to Lotus's \$195 cc:Mail Mobile for Windows, Release 2.01. There they'll find the same sophisticated features available in the LAN-based Windows package (for more information, see "The E-mail Personae," April 12, 1994).

Along with a 190,000-word spell-checker, a customizable toolbar, and the ability to define powerful message-handling rules with a few clicks of the mouse, Lotus outfits cc:Mail Mobile for Windows with a few additional features designed to address the special needs of remote users. For example, message-handling rules can notify some or all people who send you messages during a given period of time that you're on vacation by automatically responding to incoming mail using a message prepared for that purpose.

You can also specify the use of a given dialing prefix or even a calling-card number when calling out, by simply choosing from the location profiles you've predefined. The profile for any given location also determines the communications method or protocol you can use (including standard or wireless modem, direct or network connection, IPX/SPX (NetWare), TCP/IP, X.25, ISDN, and PBX.)

cc:Mail Mobile makes it easy to move or copy messages between your LAN post office and notebook, provided you can connect your notebook to the LAN. When you launch the program, you can specify that it run in LAN mode rather than Mobile mode and then use predefined docking operations or customized rules to move or copy messages.

During testing, cc:Mail Mobile worked well for the most part, but there were some first-release glitches. When set for automatic retry, for example, it waited twice the specified period before making the call. And while cc:Mail Mobile carried out most message-handling rules beautifully, it repeatedly failed to reject messages from specified people when set to do so.

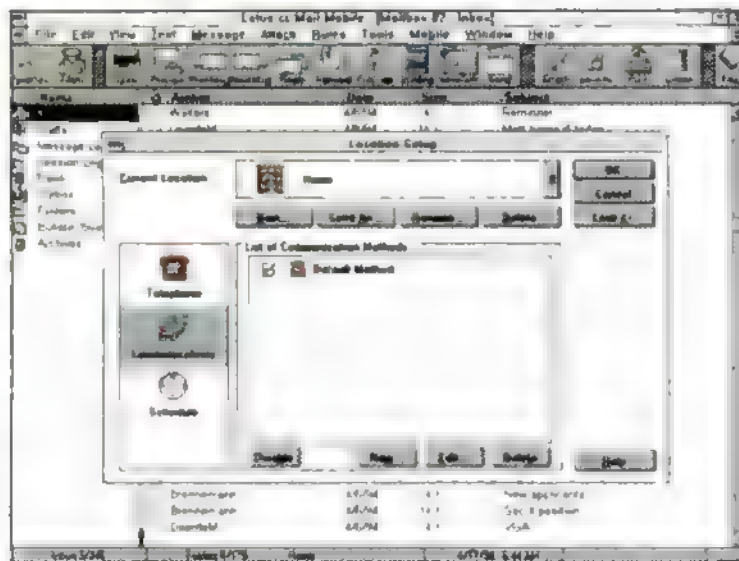
Lotus cc:Mail Mobile for Windows exceeds the

capabilities of its DOS-based predecessor, making remote cc:Mail access a much different

and more pleasant experience.

► **Lotus cc:Mail Mobile for Windows, Release 2.01.** List price: \$195; upgrade from cc:Mail Remote for MS-DOS, \$95. Requires: 4MB RAM, 6MB hard disk space, Microsoft Windows 3.1 or later. Lotus Development Corp., 800 El Camino Real West, Mountain View, CA 94040; 800-448-2500, 415-961-8800; fax, 415-961-0215.

Circle 431 on reader service card



CONNECT: Dial in from wherever you are.

Mathematics

New Math: Maple Looks and Calculates Better

BY BARRY SIMON

Mathematicians will be impressed by the way the new features in Release 3 of Waterloo Maple Software's \$795 Maple V add up. There are substantial improvements to its core engine, graphics capabilities, and user interface. With this release, Maple can compete with Mathematica's graphical strengths and with Macysma's calculating strengths.

Among the changes: two new differential equation solvers and better handling of square root branch points in the symbolic calculation of integrals. Another important addition is an "assume" facility that lets you tell Maple to do symbolic calculations assuming some restrictions on parameters. For example, an integral might converge only if some parameter is positive; unless you could tell Maple to assume that, it would have to report the integral as one it couldn't

do. This feature has been in one of Maple's chief competitors, Macysma, for years.

Maple puts some of its special functionality into libraries that you load when needed. New to this version is a library for statistics that includes descriptive statistics, statistical plots, and transforms.

The program ships with both Windows and DOS versions in the same box. The most dramat-

ic change to the Windows version is the introduction of button bars both in the main program window and in windows used to show graphics. A status bar gives you information on Maple's considerable memory usage.

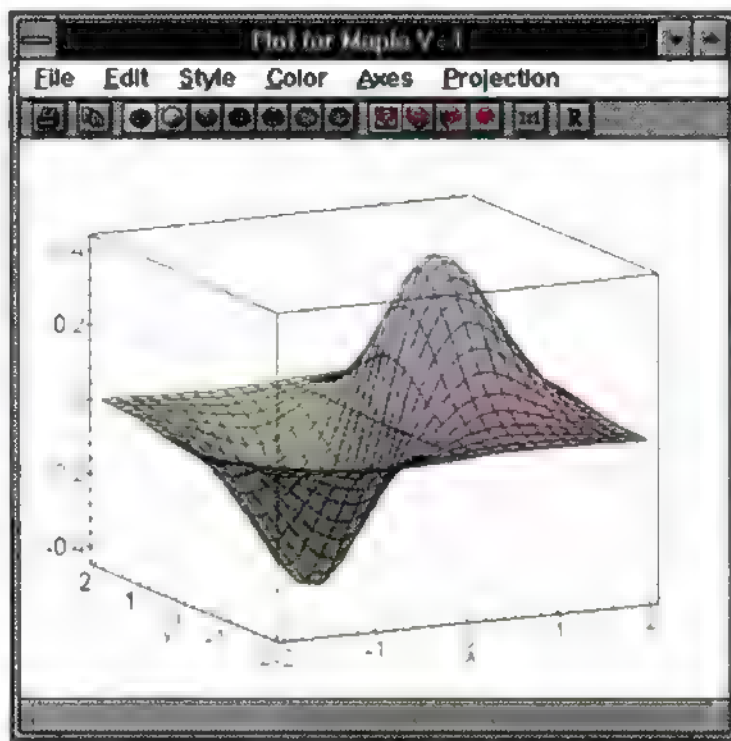
Several new export facilities are welcome additions. Entire worksheets can be saved for inclusion in a publication-quality document, and you can now export in .GIF format.

While Maple is a superb package, it has some weak spots. The special-function libraries are useful, but you must track which functions are in which libraries. And even though key-

word search has been added to Maple's proprietary help, help is still not as smooth or as familiar to users as it would be had it been created with the Windows Help engine.

► **Maple V, Release 3.** List price: \$795; upgrade, \$149. Requires: 4MB RAM, 12MB hard disk space, Microsoft Windows 3.1 or later. Waterloo Maple Software, 450 Phillips St., Waterloo, Ontario, Canada N2L 5J2; 800-267-6583, 519-747-2373; fax, 519-747-5284.

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■ Mapping

Automap Pro Takes to the Road with New Database Tool

BY DON WILLMOTT

If you want to drive from Baltimore to Miami, the directions are easy: Just get on I-95 and head south. But what if you want to travel on interstates only half the time, make side trips to Atlanta and Panama City, and travel only during daylight hours? Automap Pro will hand you a detailed itinerary and directions in seconds, and you'll be on your way.

Automap's \$399 program is a fun tool for the armchair traveler, but the Pro version (not to be confused with the more consumer-oriented \$99.95 Automap Road Atlas) also includes database features that turn it into an effective business traveler's aid for anyone who hits the road to

visit clients or customers.

The program's strength is its road maps, which are easy to move around and zoom in and out of, once you get the hang of the unlabeled icons that run across the top of the map. You add overlays to make the maps as informative as you need them to be, adding or subtracting place-names and roads (there are 410,000 miles of roads and 120,000 locations included).

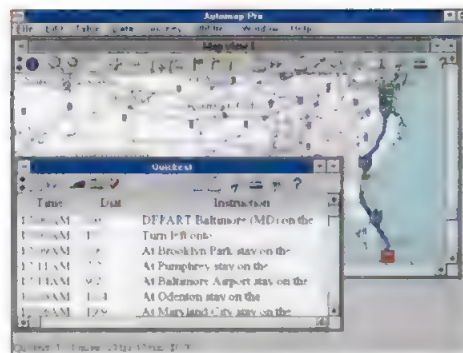
STARRY POTENTIAL

Ask for a route from point A to point B to points C, D, and E, and you get it quickly, even as you stipulate more and more requirements: no ferries, driving just 5 hours a day, avoiding toll roads, whatever. You can get the fastest route, the shortest route,

or the route that matches your preferences.

If you keep records of your clients in a dBASE III Plus-compatible format, you can link to them and "geo-code" them, converting their ZIP codes or area codes to map coordinates so that they can show up on the map. You can even link sound or video files to a map location.

This is the hardest part of Automap Pro to use: You'll find it a challenge to get the records linked and presentable on the map. But once you do, you'll see the payoff as you figure out, for example, the most efficient way to visit your seven customers in Southern California—then attach .BMP files that show their pictures at their map locations.



INTERACTIVE MAP: Automap Pro produces customized directions and maps in seconds.

With a little imagination you can design your own apps, and at the end of a long day on the road, there's no map to fold.

► **Automap Pro.** List price: \$399; \$40 rebate for Automap Road Atlas users. Requires: 2MB RAM (4MB recommended), 6MB hard disk space, Microsoft Windows 3.1 or later. Automap Inc., 1309 114th Ave. SE, #110, Bellevue, WA 98004-6999; 800-440-6277, 206-455-3552; fax, 206-455-3667. Circle 429 on reader service card

■ Communications

StarLink Turns HP 100LX Into a PDA Pager

BY BILL HOWARD

It may not give you access to the full force and fury of the information superhighway, but the HP StarLink paging service does provide a steady stream of useful data when you're away from your PC.



I'M CALLING YOU: The StarLink module picks up messages within minutes.

The StarLink wireless messaging service is a \$229 PCMCIA Type II pager card that goes inside an HP 100LX palmtop PC (\$549 to \$749). You buy the palmtop and pager card (a Motorola NewsCard with embedded HP-specific software), then pay HP \$20 to \$130 a month for 100 messages, the price depending on whether you choose 80- or 240-character messages and local, regional, or wireless paging. You can also pay \$5 a month for headline news, sports, and weather and an optional \$10 to \$60 a month for comprehensive stock information.

You write only one check each month, to HP.

Basic StarLink services work much the same way standard operator-assisted paging services do: The caller dials an 800

number, gives the recipient's name or ID, and reads off a message to an operator. Or, someone can dial in by modem and send messages from a PC. The pager card doesn't need to be in the 100LX to receive messages, but since it has no display, you need the 100LX to read messages. The card standing alone can hold about 320 messages, and the 100LX will store additional messages.

STARRY POTENTIAL

The potential uses of StarLink—the ones that make it a roving information receiver—are even more enticing. You can get electronic mail summaries from systems such as MCI Mail, cc:Mail, or Lotus Notes (either all your mail or just mail from certain senders). You receive the sender's name, the subject line, and possibly the first few words of the message.

In testing, we found that StarLink worked pretty much as claimed. Comm software at the host end is crude; you must type

carefully, because you can't backspace and erase mistakes. The current pager sticks out with a half-inch bulge that holds the single AAA battery (good for about a month); future versions may be self-contained with button batteries.

Our biggest complaint was the delivery lag: anywhere from 1 to 12 minutes. Traditional alphanumeric pages usually arrive within a minute.

If you're already using a 100LX, StarLink can be a great asset, with more message storage and a bigger on-screen viewing area than a pager. The monthly cost is essentially the same as, or less than, standalone alphanumeric paging. Carefully choose the accompanying pager service provider; currently SkyTel offers a few more bells and whistles.

► **HP StarLink.** List price: \$229. Hewlett-Packard Co., 1000 NE Circle Blvd., Corvallis, OR 97330; 800-917-5465, 503-757-2004. Circle 430 on reader service card

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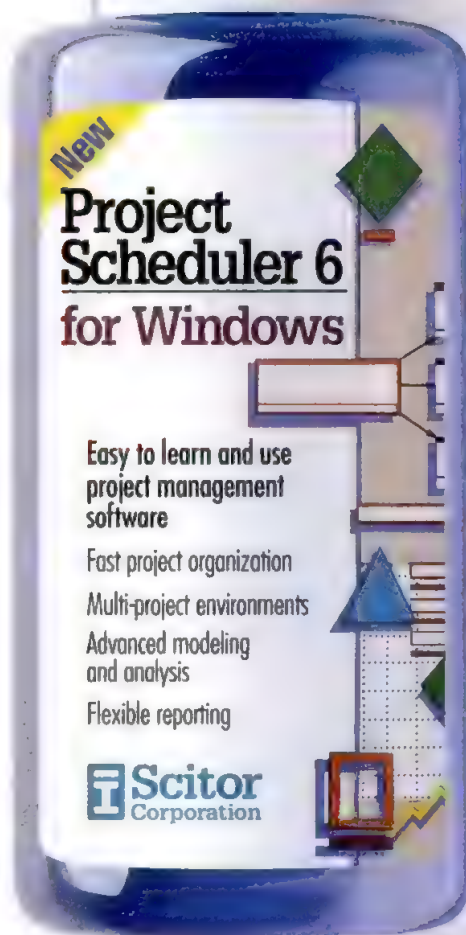
Unlike many software programs that claim to be easy to use, Project Scheduler 6 for Windows really is, and the experts agree. According to a recent *InfoWorld* review, "Project Scheduler's interface is a joy to use...Scitor understands how people use project management software."¹

But Project Scheduler 6 offers managers more than just relief from occasional project stress.

"Project Scheduler 6 surpasses



Microsoft Project and CA SuperProject – in addition to challenging many high end packages." wrote *InfoWorld*.²



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format. Evaluating "what-if" scenarios is also a breeze with Project Scheduler's ability to perform multiple undo/redos in seconds.

Our software's built-in object-oriented report writer provides extraordinary flexibility and convenience. And as the first project management software to share information with other ODBC-compliant applications, it even helps build greater reporting and data management efficiency throughout the enterprise.

So, as *Windows Magazine* recently put it "If you're seeking a Windows project management product that does it all and then some, Project Scheduler 6 fills the bill."³

Scitor Corporation

■ PIMs

Polaris Advantage: PackRat Lite Without the Problems

BY BARRY SIMON

Polaris Software's PackRat is a Windows personal information manager (PIM) pioneer admired more for its high-end power than for its usability. With the \$149 Polaris Advantage, Polaris reaches out to a broader audience with a less expensive, easier-to-use PIM.

Because Advantage is based on updated PackRat code, it has a similar look and feel, using a file-folder metaphor with ten file tabs that switch among ten different views of your data.

Given the many problems with the most recent PackRat release, we were pleasantly surprised by how well Advantage performed on our tests.

Advantage has most of the features you'd expect in a full-featured information manager. There's an address book that links to a Contact Manager that lets you insert names and addresses into Ami Pro, Microsoft Word for Windows, or WordPerfect for Windows. It is also supported by fax programs like Eclipse Fax, FaxWorks, and WinFax Pro.

Numerous built-in report tools let you print out calendars, phone books, and to-do lists, with special support for Day/Runner, Day-Timer, Filofax, and Franklin paper appointment books and for several models of the Casio BOSS and Sharp Wizard.

Of course, Advantage doesn't have everything PackRat does. It's missing PackRat's customizable forms, unlimited folders, program objects, macro language, report generator, and time and billing module. You know where Polaris is positioning Advantage when you notice that it has a special import utility for Lotus Organizer but not for PackRat. To import PackRat

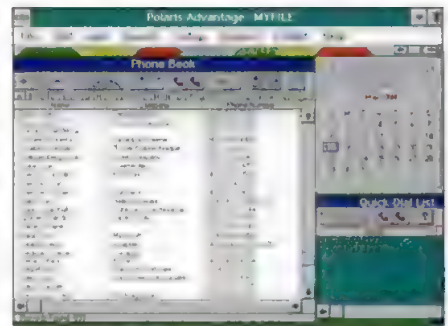
data into Advantage, you need to use the ASCII import, which will lose notes and attachments.

PackRat 4.1 handled alarms and attachments extremely well, and Advantage doesn't meet that high standard. In Advantage, the snooze time for an alarm is hard-coded at 30 minutes, and you can't pick a date for an alarm off the calendar. The list of attachments for a person in your address book pops up a window showing only

the person's name, company, and telephone number. Without a date stamp, there's no way to distinguish among different calls to the same person.

The entry-level PIM user probably doesn't need a full-fledged contact manager and can live with the alarm limitations. Almost everything else in Advantage is a pleasure to use.

► **Polaris Advantage.** List price: \$149. Requires: 4MB RAM, 5MB hard disk space, Microsoft Windows 3.1 or later. Polaris



CLEAN DESK: Advantage uses a file-folder metaphor. Data is attached to each folder.

Software Inc., 15175 Innovation Dr., San Diego, CA 92128; 800-722-5728, 619-592-7400, fax, 619-592-7430.

Circle 420 on reader service card

■ Video Utilities

DisplayMate Helps Your Monitor to Glow

BY ALFRED POOR

As computer users, we spend a large part of the day staring into the glass eye of our monitors, yet few of us take the time to adjust the image for optimal results. Aside from playing with the

tem for best results.

The program can be run directly from a floppy disk without any installation, making it easy to run on different computers. In addition to details about what to look for in the test images it displays, the program also gives instructions on how to use your monitor's controls to get improved results.

DisplayMate for Windows does not draw the line at your monitor's controls, either. The information screens also include suggestions about other hardware factors, including cabling

The package relies on the Windows display driver, so you don't need to hassle with configuring the software to match your hardware. The program supports color depths up to 24-bit, and it runs in any Windows-supported resolution.

You can configure the program to make it as complex or simple as you want. By default, it displays brief explanations and uses a subset of the test suite, but you can choose the full explanations and use all the tests if you prefer.

Most users may not take the time to take advantage of the complete tune-up features available, but any Windows user can benefit from a few minutes with the briefer setup portion of the program. Not only can it help you evaluate your system's image quality, but it can also improve the quality in many cases.

► **DisplayMate for Windows.** List Price: \$79 until September 30, 1994; \$129 thereafter. Requires: 2MB RAM, Microsoft Windows 3.1 or later. Sonera Technologies, P.O. Box 565, Rumson, NJ 07760; 800-932-6323, 908-747-6886; fax, 908-747-4523.

Circle 419 on reader service card



CLEAR VIEW: The opening menu makes it easy to get to tests and configuration options.

brightness and contrast dials a little, many of us take a fatalistic attitude about our monitor image and simply accept what we see.

But if you want to make sure you're getting the most from your monitor, the tests and utilities in DisplayMate for Windows (\$79 from Sonera Technologies) can help you set up and adjust your display sys-

tem and your graphics adapter. Many adapters have sophisticated controls available through software—such as gamma correction—that can affect image quality in terms of gray-scale linearity and color matching. By using the monitor controls in conjunction with graphics adapter adjustments, you can often achieve noticeable improvements in image quality.



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Personal Information Management

ECCO 2.0 Gains Group Scheduling and Data-Sharing

BY GREGG KEIZER

The most powerful PIMs do it all. They track your schedule, organize names and addresses, and collect a dizzying variety of information all in one place. ECCO Professional, Version 1.1, a recent Editors' Choice recipient ("P Is for Personal," May 17, 1994), was applauded for all that and more.

In Version 2.0, however, this \$279 Windows PIM powerhouse takes aim at the workgroup world by adding comprehensive group-scheduling, data-sharing, and file-synchronization features. ECCO may not be much easier to use than it was before; the most flexible and advanced functions still require time to learn and digest. But with these enhancements, it has become one of the best PIMs for keeping everyone in an office organized and on the same wavelength.

With some minor exceptions, Version 2.0 looks the same as Version 1.1. ECCO applies an unusual metaphor to information management by treating each piece of data as a separate item in a hierarchical outline. ECCO excels at storing, displaying, and cross-referencing unstructured information. And its graphics calendar views are also top-notch.

WORKGROUP POWER

Several new additions make ECCO 2.0 a slightly stronger PIM for individuals. You can now choose from a dozen different phone-book record layouts (and even customize the blank fields found in them), drag and drop information between visible outlines, and view the contents of any folder by double-clicking on its name rather than dragging it to an existing outline.

ECCO can now also serve as the address book for Delrina WinFax PRO.

Such embellishments are almost insignificant when compared to the program's workgroup features. The most impressive new

such mail can be saved as notes in the appointment section of the calendar outline.

Even better, ECCO can be installed so that it's able to view calendars and send mail to anyone using Microsoft's Schedule+

(part of Windows for Workgroups) in order to integrate group scheduling in an organization where the PIM isn't on everyone's PC. ECCO's workgroup scheduling is both strong and easy to operate, though it's difficult to tell which attendee has blocked out what times on your cal-



GET TOGETHER: Time conflicts appear in red when you schedule group meetings among ECCO or Microsoft's Schedule+ users.

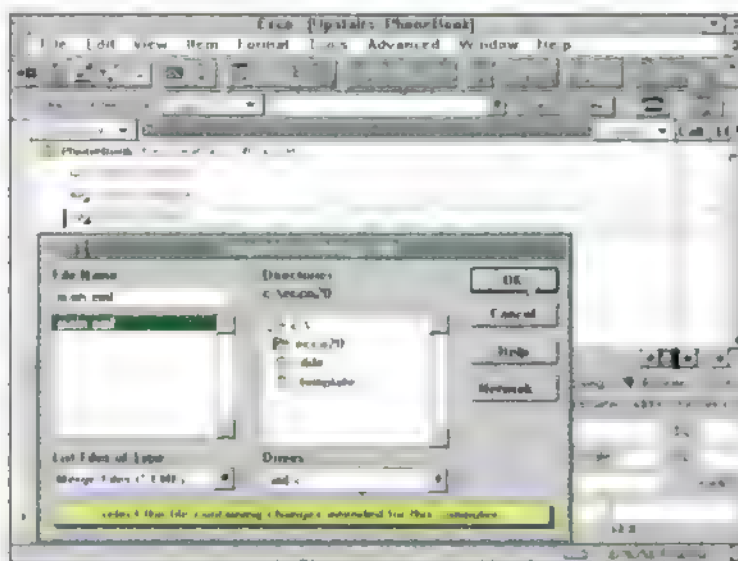
endar, since all are shaded with the same gray. feature is group scheduling, which uses a MAPI-, CMC-, or VIM-compliant e-mail package to view other ECCO users' calendars and send meeting-related mail over the network. You can quickly invite attendees from the user list, book resources such as meeting rooms and equipment, and delegate meeting responsibilities to another user.

ECCO will automatically search for free time among all the required attendees and highlight time conflicts both graphically on the calendar and in the attendee list. A meeting mail window inside ECCO lets you read and reply to invitations and follow-up messages without leaving the application, and all

endar, since all are shaded with the same gray.

IT'S NICE TO SHARE

ECCO shares more than just meetings over a LAN Manager, Novell, or Windows for Work-



UP TO DATE: To reconcile one or more replicas with the main ECCO file, you import a small file that contains only the changes.

groups network (the folks at Arabesque say that support for LANtastic and VINES will be available shortly). You can designate phone books, calendars,

and outlines as being available to some or all ECCO users by setting a wealth of access privileges.

Record locking and password protection are available, and ECCO's flexibility in designating information as either public or private is remarkable. Not only can you mark different views in the same file as either public or private for any one user, but you can do the same for individual columns in any view or even tag a single item as confidential.

LINK UP, SYNC UP

File synchronization, critical to on-the-road or at-home workers, is also now part of the package. File reconciliation lets you make multiple replicas of your master file quickly and then later merge only the changes by exporting and importing relatively small files. A 50K merge file, for instance, resulted from substantial changes made to a 2MB ECCO file. You can synchronize from disk via network e-mail or, if you're using a remote-access application, by long distance.

Although the ECCO program remains tough to master, its newfound data sharing should ease the transition to its outline approach. One advanced ECCO user could conceivably create sophisticated outlines and filtered views for all to see and use. Add slick group scheduling and file syncing, and ECCO becomes irresistible in a workgroup environment, where power and flexibility in managing information are of paramount importance. Before, ECCO was the power PIM for one. Now, it's the power PIM for the group.

► **ECCO Professional 2.0.** List price: \$279; upgrade, \$49.95. Requires: 2MB RAM (4MB recommended, 4MB hard disk space, Microsoft Windows 3.1 or later. Arabesque Software Inc., 2340 130th Ave. NE, Bellevue, WA 98005; 800-457-4243, 206-885-4272; fax, 206-885-0127. Circle 434 on reader service card

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*Features included with some models. [†]List price, dealer prices may vary. Monitor not included. ¹The DX4-based HP Vectra VL2 PC available in May, 1994. ²Other capacities available. ³First year on-site, 24-hour service. Second and third year return to dealer. ⁴When available from Intel. ⁵The HP Vectra N, M, and XM come with MS-DOS® 6.0 and MS Windows 3.1 pre-installed, and the HP Vectra VL2 and XP come with MS-DOS® 6.2 and MS Windows for Workgroups 3.11 pre-installed; HP mouse and keyboard included. MS-DOS is a U.S. registered trademark and Windows is a trademark of Microsoft Corporation. Pentium and Intel Inside logo are U.S. trademarks of Intel Corporation. ©1994 Hewlett-Packard Company PPG402



Need we say more?

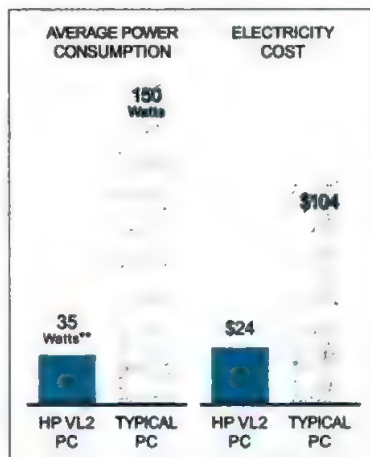
Green PCs that put you in the black.

What our new HP Vectra VL2 PC does for the environment is great. What it can do for your bottom line is astonishing. A thousand of these PCs could save your company \$80,000

a year in electricity bills. That's the kind of green everyone appreciates.



The HP Vectra VL2 can automatically switch from *active* to *standby* or *sleep* modes when not in use. That, combined with savings from our 14-inch Ergonomic 1024 monitor, cuts consumption from a typical 150 watts to 35 watts. Cutting annual energy costs about 75%. With no effect on performance.



So our support of the EPA's Energy Star program is all to the good. Good for the planet. Very good for your profits.

Expand the boundaries of your PC world. With HP's flexible low-end power. Midrange with integrated networking. And high-end processing. All with the features only HP offers.

Our new HP Vectra VL2 comes loaded with everything but a high price. The HP Vectra XM handles advanced business applications and communications with ease. And the new HP Vectra XP is packed with power for scientific calculations or desktop publishing.

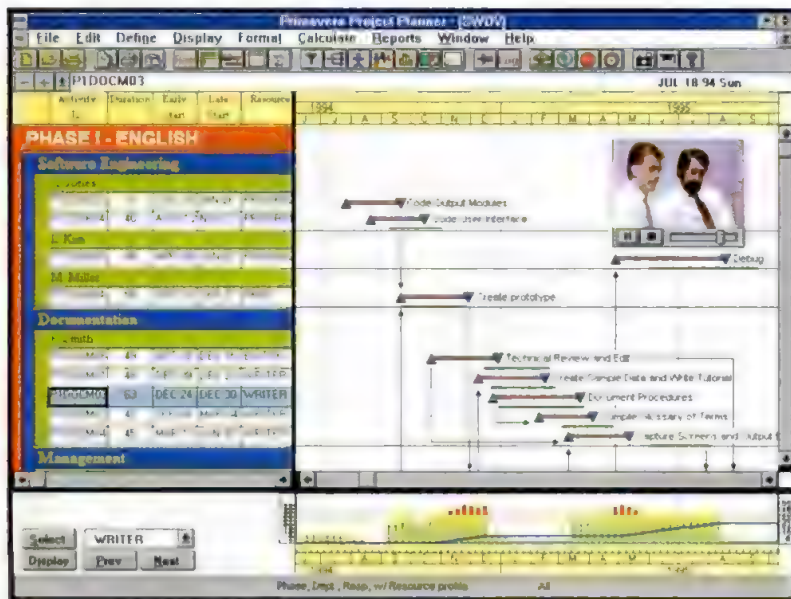
Our PCs come with a whole laundry list of features.⁵ But the features that distinguish these PCs from all others won't be found on any spec sheet. They're the reliability and assurance you get from HP standing behind the products they make. No wonder BIS Strategic Decisions has called HP "the fastest-growing PC company in the U.S." Call 1-800-322-HPPC, Ext. 8088 for more information or for the Hewlett-Packard dealer nearest you.



Annual electricity costs based on PCs (including monitors) running 24 hours a day. **Power consumption of the HP Vectra VL2 and HP 14-inch Ergonomic 1024 display (D2805A) in sleep mode. The HP Vectra VL2 daily usage reflects 3 hours active, 5 hours standby, and 16 hours sleep mode, for an average consumption of 35 watts. Potential annual cost savings based on 1,000 PCs using 35 watts each versus typical PC consumption of 150 watts. Electricity costs of 8 cents/kwh assumed. Actual savings may vary. HP 14-inch Ergonomic 1024 display (D2805A) with Display Power Management System is used in calculation.

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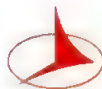
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NEWS OF ANNOUNCED PRODUCTS AND UPGRADES

By Adam A. Hicks

IMPROVED

Trinzic Grows an Upgrade

You can access any database on your network and incorporate that information into intelligent and useful reports using **Trinzic Corp.**'s latest upgrade to its decision support software. Forest & Trees 3.1 supports more data sources than the previous version did by directly accessing any ODBC-compliant database as well as Informix-OnLine, DB2/2, and Sybase NetGateway databases. The package makes it easier for you to edit the layouts, add pictures and graphs to reports (including 3-D charts), and view data locally with support for views up to 64,000 rows.

► **Forest & Trees 3.1.** List price: \$695. Trinzic Corp., 404 Wyman St., #320, Waltham, MA 02254; 800-952-8779, 617-891-6500; fax, 617-622-1544.

Circle 403 on reader service card.

NEW

Notebook Power in a Tablet

Toshiba America Information Systems' new Dynapad series of pen-based tablet computers, equipped with 40-MHz 486DX2 processors with 8K internal cache, will handle vertical applications, in color, with the power of true notebooks. The 4.4-pound Dynapads come with 4MB of RAM (expandable up to 20MB), an 80MB hard disk, and two PCMCIA slots. Since the stylus is only a pointing device to let you navigate software and forms-processing applications, you'll have to attach an external keyboard to make the unit function like a notebook.



Toshiba T200CS

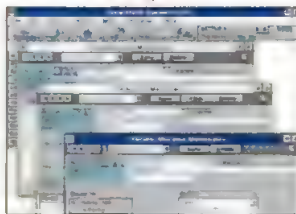
The 1.6- by 10.6- by 8.2-inch case holds the 9.5-inch-diagonal screen, which is available in monochrome (T200) or in a dual-scan color model (T200CS).

► **Toshiba Dynapad T200.** List Price: \$2,499.

Toshiba Dynapad T200CS. List Price: \$2,899. Toshiba America Information Systems Inc., P.O. Box 19724, Irvine, CA 92713-9724; 800-334-3445, 714-583-3000.

Circle 404 on reader service card.

HOT PROSPECT



Great Plains Client/Server Accounting Migrates Platforms

Prices continue to drop on high-end servers and workstations, and the move to downsize mission-critical apps continues. Great Plains Dynamics C/S+, a scalable accounting and financial applications package with a graphical interface from Great Plains Software, is optimized for such client/server processing. Tasks such as creating reports or performing analyses that you know to be processor-intensive can be marked for offloading to especially capable clients and servers. Alternatively, a user can send a job to the network for processing on a case-by-case basis if they've been granted security access.

Currently, the program will run on Windows, Windows for Workgroups, Windows NT, and Macintosh operating systems. By year's end, Great Plains plans to support Power Macintosh, AIX for IBM RS/6000, and Solaris on a Sun SPARCstation operating systems.

The package implements Open Database Connectivity drivers and provides SQL connectivity along with numerous high-end financial-processing features like 66 character account numbers, 367 accounting periods per fiscal year, statistical account transactions, and variable and fixed allocations.

► **Dynamics C/S+.** List price: \$5,000 to \$20,000. Great Plains Software, 1701 SW 38th St., Fargo, ND 58103; 800-456-0025, 701-281-0550; fax, 701-281-3700.

Circle 402 on reader service card.

NEW

Tiny Industrial Strength And Size Storage for The Road



Thanks to **MiniStor Peripherals Corp.**'s newest member of the More MB Drive family, PCMCIA drives can handle

mass storage and **260MB** mass transit. Using **PCMCIA drive with case.** Stac Electronics'

Stacker Anywhere data-compression utility, the MP260P3's native 130MB capacity is doubled to 260MB. The disk features Adaptive Power Management technology to reduce battery drain. Unless you commonly run into shock forces greater than 200g the unit is fully ruggedized to withstand heat, humidity, high-altitude, and shock in any environment and comes with a "Pocket Socket" plastic and rubber transport case for added protection.

► **More MB Drive.** List price: 260MB model, \$499. MiniStor Peripherals Corp., 2801 Orchard Pkwy., San Jose, CA 95134; 800-943-0165, 408-943-0165; fax, 408-434-0784.

Circle 405 on reader service card.

NEW

PowerLook Scanner: High Speed, High Quality, Low Price

Now you can have scanned documents of a quality that was formerly available only by using drum scanners costing tens of thousands of dollars. In fact, vendors are able to offer you high-quality flatbed scanners for under \$4,000. The PowerLook, a newly released 30-bit flatbed color scanner from **UMAX Technologies**, gives you over 1 billion colors and 1,024 shades of gray, an average dynamic range of 3.0 Density, and a maximum interpolated resolution of 2,400 by 2,400 dots per inch using UltraView software. Designed to generate accurate one-pass scanning, the PowerLook does not require a prism, color filter, or color lamp.

You will, however, find a bus-caching design

New & Improved

called FIFO (first in, first out) and a 2MB output buffer, which enables you to scan an 8- by 11-inch color image at 600 dpi in 1 minute 6 seconds. The unit is equipped with a built in SCSI-2 interface.

► **PowerLook.** List price: \$3,495. UMAX Technologies Inc., 3353 Gateway Blvd., Fremont, CA 94538; 800-562-0311, 510-651-8833; fax, 510-651-8834.

Circle 406 on reader service card.

NEW

Multimedia Cards Push Sound Into Third Dimension

Sound that seems to come from every angle is now available for your home system at an affordable price. **Media Vision** has three new cards: the Media Vision Premium 3-D for SCSI-2 and MCD drives, and the Media Vision Pro 3-D.

All three cards have 16-bit sound enhanced by Sound Retrieval System technology and 20-voice FM-synthesis, and all are compatible with the Creative Labs Sound Blaster card and most audio standards, including MPC Level 2. The Pro 3-D sound board comes preinstalled with Media Vision's Professional Wave Table Upgrade, which includes the sound engine from Korg professional synthesizers (it can produce 32-note polyphony) and 4MB of sample sounds. The Wave Table Upgrade can be added to both the Premium 3-D cards and any other cards that support the WaveBlaster connector.

Not to be left out, **Multiwave Innovation** has released 3D Space to upgrade its Audiowave Platinum 16 sound cards and the Dreamwave upgrade for any WaveBlaster-compatible MIDI interface. Using your current speakers, 3D Space adds depth and realism to your programmed material by turning stereo recordings into full 360-degree sound fields and mono recordings into 270-degree sound fields. Dreamwave features 2MB of sample sets, 24-note polyphony, and supports General Synthesizer extensions.

► **Media Vision Premium 3-D SCSI2, Media Vision Premium 3-D MCD.** List price: \$199. **Media Vision Pro 3-D.** List price: \$379. **Media Vision's Wave Table Upgrade.** List price: \$199. Media Vision, 47300 Bayshore Pkwy., Fremont, CA 94538; 800-348-7116, 510-252-4453; fax, 510-252-4499.

Circle 407 on reader service card.

► **3D Space.** List price: \$79. **Dreamwave.** List price: \$199. Multiwave Innovation Inc., 747 Camden Ave., #D, Campbell, CA 95008; 408-379-2900; fax, 408-379-3292.

Circle 408 on reader service card.

BRIEFS

Security Software

Computer Security Corp.'s Dr. Solomon's RingFence lets an administrator load TSRs on the network to lock out unauthorized disks from specified systems on the network. This will ensure that no one can load any viruses or illegal software or steal important corporate data off unattended systems. The package is priced at \$29.95 per workstation for one to five workstations. 714-840-4656.

In addition to disk locking, **DialLOCK Boot** from **COM&DIA, L.L.C.**, has network data encryption and file tracking. Instead of individual passwords for each file or application, the program lets you use one log on to access all files you have rights to, permanently write-protect important files such as .EXE and DOS commands, and even has a basic auditing utility. Pricing for DialLOCK Boot starts at \$199. 919-878-6503.

Symantec Corp., the well known Norton Utilities manufacturer, has two new packages in the DiskLock Series that provide security features for Windows, DOS, and Macintosh systems and networks. Symantec can be reached at 800-441-7234 or 503-334-6054.

DiskLock 3.0 (\$99 for a single-user license), protects your desktop before loading the operating system so no unauthorized access of the system, directories, or individual files is possible. However, you don't have to lock each file separately; instead, you can mark groups of files or directories in one step. And if you are away from your desk for extended periods, the package will block access to the system while keeping a log of any unsuccessful access attempts.

DiskLock Administrator is Symantec's solution for the network administrator. The package is priced at \$891 for Administrator 10-pack and gives the administrator all the functionality of DiskLock 3.0 PC version but lets the administrator configure and distribute security across different platforms from a central location.

NEW

Setup Advisor Makes Sure Your Hardware Upgrades Work

As you upgrade your PC, hardware installation snags are going to be more the rule than the exception. With a little help from **TouchStone Software Corp.'s** Setup Advisor, things may go a little more smoothly. Setup Advisor reports all your PC's IRQ settings, DMA channels, I/O ports, and RAM and ROM addresses. This mini-utility gives you the ability to inventory your current hardware configuration in order to correct inappropriate set-



A single button bar controls Setup Advisor.

tings and determine if upgrades will conflict with your hardware, which will make installation easier. The package includes a tutor feature that can temporarily take control of your menu to provide you with explanations and possible options.

► **Setup Advisor.** List price: \$29.95. TouchStone Software Corp., 2130 Main St., Huntington Beach, CA 92648; 800-531-0450, 714-969-7746; fax, 714-960-1886.

Circle 409 on reader service card.

NEW

EyeTel Adds Full Motion to the Virtual Meeting Table

EyeTel Technologies' Communicator I and II allow users to work on files together across phone lines and ISDN lines. EyeTel's newest product, Communicator III Generation 3, adds interactive full-motion point-to-point or multipoint video-conferencing over a LAN or WAN connection. Your image and voice are present at the meeting while you're annotating files with text or drawings.

The software supports input from all types of digital hardware, dials using voice commands, and sends and receives Video Mail with MPEG encoding at 30 frames per second. The Communicator III Generation 3 includes a video capture board, an H.320-compatible CODEC card, a video camera, a microphone, and speakers.

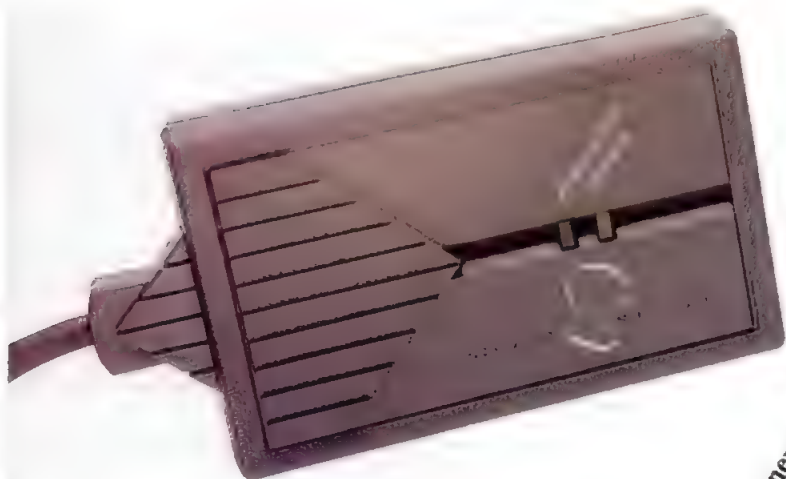
► **Communicator III Generation 3.** List price: \$5,995. EyeTel Technologies Inc., #206, 267 W. Esplanade, North Vancouver, British Columbia, CA V7M 1A5; 800-736-3236, 604-984-2522; fax, 604-984-3566.

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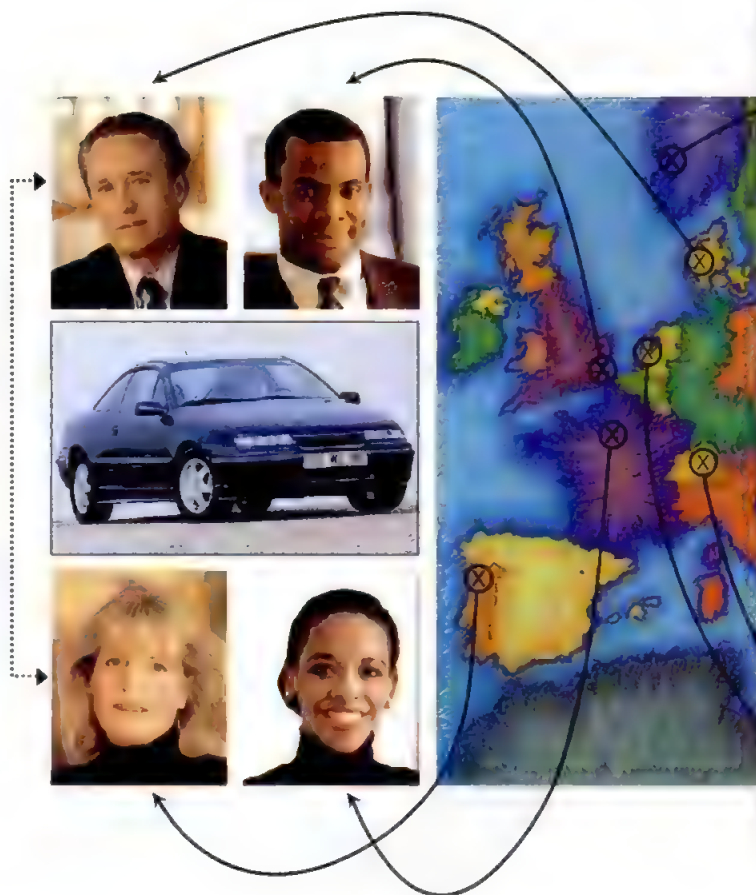


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CIRCLE 007 ON READER SERVICE CARD



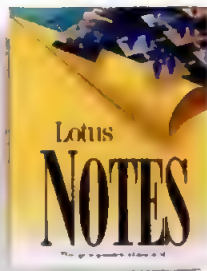
WHEN A LAWYER AT GM'S
HQ IN ZURICH IS WORK-
ING ON A DOCUMENT
IN CONJUNCTION WITH
STAFF IN LONDON, PARIS
AND ANTWERP, ALL HAVE
ACCESS TO THE SAME
INFORMATION VIA NOTES.
AND WITH NOTES, ALL
TEAM MEMBERS CAN
CONTRIBUTE AND KEEP
UP TO DATE.



To aggressively meet the challenges of competing in a 'Unified Europe,' General
Central to this new structure is Lotus Notes, the van

GENERAL MOTOR UNIFY EUROPE. HOW

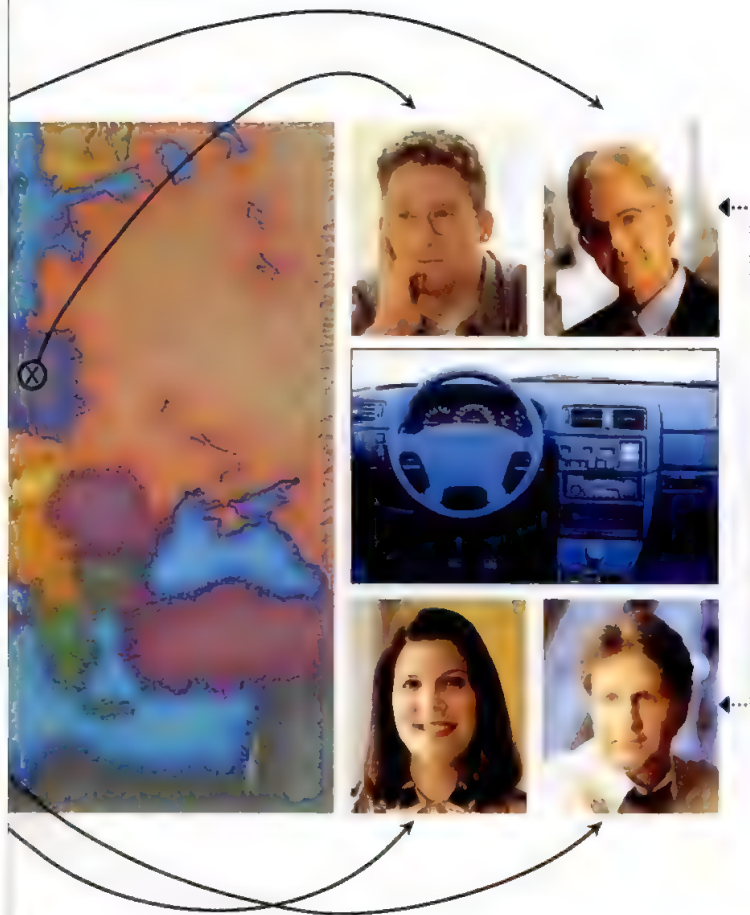
GM Europe is as large and complex as some
countries. With over 100,000 people, plus 6,500 dealers,
it operates across 18 languages and
countless networks. With multinational
divisions including Opel, Vauxhall and
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Lotus Notes® unique teamwork capabilities and

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financials. To improve manufacturing standards.
To upgrade dealer service. To track market trends.
And finally, to accelerate key business processes.

According to Pat Hickey, GM Europe's OIS
Information Manager, 'Notes is the forum for exchanging



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LAPTOP COMPUTERS WITH
LOTUS NOTES. WHEN THEY
MAKE A CALL, THEY CAN
RECONNECT TO MAKE SURE
THEY'RE DEALING WITH THE
LATEST PRODUCT INFORMA-
TION. AT THE SAME TIME, ANY
ISSUES THAT ARISE IN THE
FIELD CAN BE COMMUNICATED
THROUGH NOTES SO PEOPLE
BACK AT HEADQUARTERS
CAN REACT QUICKLY.

Motors Europe has streamlined, with the help of EDS, a Lotus Notes Business Partner, guard of a new category of software called groupware.

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information and ideas to make us more competitive. Choosing it is one of the most popular decisions we've ever made.*

Today, operations are so efficient that the entire European continent is run from a central office of just 200 people and so effective that General Motors has grown from #5 in Europe to #2 over the last few years.

Now plans are underway to get approximately

40,000 Notes users on line in the US by 1996.

Evidently, what's good for General Motors Europe, is good for America.

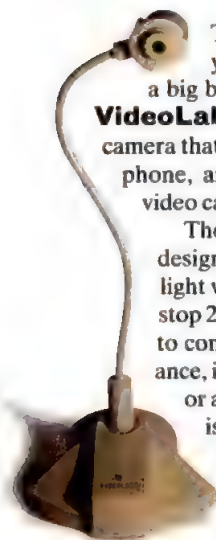
To learn what Lotus Notes can do for your company, **call for our free video: The Executive Guide to Lotus Notes.** Or to find out about becoming a Lotus Authorized Business Partner, call **1-800-828-7086, ext. 9696.***

Lotus
Working Together

New & Improved

NEW

Digital Video Camera and Capture Board from VideoLabs



VideoLabs' FlexCam camera.

To mount a camera on your PC you're not going to have to add a big box. In fact, the FlexCam from **VideoLabs** features a FlexCam video camera that looks as if it could be a microphone, and comes with a full-motion video capture board.

The high-resolution camera is designed to operate in high or low light with a sensitivity of 2.5 lux at f-stop 2.0 and includes Windows APIs to control shutter speed, white balance, image size and scale, and video or audio mute. The optical system is adjustable from 1/4-inch to infinity for a maximum of 50:1 magnification. The FlexCam video camera also has two microphones that you can attach to third party sound cards, and it supports the use of two heads so you can

create double video inputs.

► **FlexCap.** List price: \$595. VideoLabs Inc., 5270 W. 84th St. Minneapolis, MN 55437; 612-897-1995; fax, 612-897-3597.

Circle 410 on reader service card.

IMPROVED

UnInstaller Makes Sure Code You Don't Want Is Gone

Hard disk space is a prime resource, and with **UnInstaller 2 for Networks** from **MicroHelp**, a network administrator can delete programs from a central location and be sure all corresponding files were erased without having to access each desktop individually. Once you delete a program in UnInstaller, the program polls all users of the application, verifies that the application should be deleted, and removes all of the associated files (including .INI files).

Other tools allow you to delete unwanted system files (like fonts and video drivers), any duplicated files, and files left over from manual uninstalls. When you use UnInstaller along with the INIClean tool, you can recover lots of valuable disk space.

► **UnInstaller 2 for Networks.** List price: \$995 per server. MicroHelp Inc., 4359 Shallowford Industrial Pkwy., Marietta, GA 30066; 800-922-3383, 404-516-0899; fax, 404-516-1099.

Circle 414 on reader service card.

BRIEFS

Security Software

PC Guardian, the makers of Notebook Guardian line of products, has released **Encryption Plus**, Version 2.0, an encryption program to protect desktop PCs and notebooks. The \$49.95 package encrypts data on the local drive only when it is in memory, so the process is transparent to the user, and can also encrypt data for modem transmission. 800-288-8126, 415-459-0190

Kryptic for Windows from **Marathon Computer Press** provides security for systems running Microsoft Windows 3.1 or later, or Microsoft Windows for Workgroups 3.11, using an 8,192 bit encryption algorithm. Special pricing is available through July 1st, 1994. The single-user version is available through July 1, 1994 for a special price of \$79.95. Afterwards, the price will rise to \$249.95. 804-363-8330.

Productivity Tools

If you're upgrading your printer circuit board, **Chip Quik** has shipped a surface mounted device removal kit. The **Chip Quik SMD Removal Kit** has everything you'll need (except the soldering iron and dental pick) to perform a chip removal neatly and without damaging your board. The kit costs \$12, plus \$2 shipping and handling. 800-836-2447, 508-879-3131.

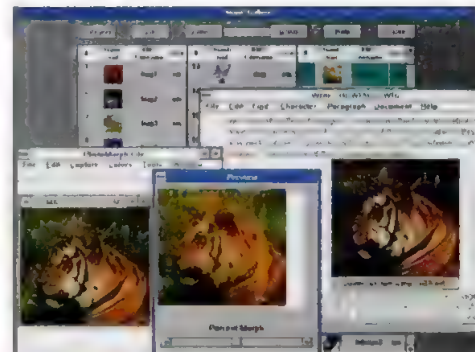
Make DOS commands more intelligible using **Easy English DOS** (\$49.95) from **Natural Language Solutions**. The program eliminates most of the DOS learning curve using NLS's SmartLogic algorithm, which interprets and carries out the commands you type. The package requires DOS 3.0. 800-327-9867, 212-752-8351.

The **Diskette Catalog Manager 2.0**, a Windows package from **Redstone Technology**, identifies disks and maintains a database of the files located on each disk, so you won't waste storage space with duplicated files and will always know exactly which disk has the file you need. The product is priced at \$49.95 but if you order before September 1, 1994, it will only cost you the shipping charge (\$9.95 in the U.S.). 800-871-8010, 713-280-8010.

NEW

Morphing Lessons from Andover

After you look through the many tools and tutorials included in the **Morphology 101 CD-ROM** from **Andover Advanced Technologies**, you'll be animating like a Hollywood professional before you know it. The CD-ROM packs a lite version of **PhotoMorph**, which was one of the products chosen for PC Magazine's Best of 1993 issue. **PhotoMorph** lets you morph and warp images and put animation together using chain clips in a storyboard or an .AVI clip sequencer. You'll also find a version



Morphology 101 combines tools and tutoring.

of **Access Softek's Matinee** software to turn your video morphs into screen savers, an animation gallery with over 70 morphing samples, and 300 photos ready to morph. There's also a fully interactive tutorial called "How the Pros Morph" that demonstrates and explains morphing techniques.

► **Morphology 101.** List price: \$39.95. Andover Advanced Technologies, 239 Littleton Rd., #2A, Westford, MA 01886; 800-279-9674, 508-392-1362; fax, 508-392-0458.

Circle 413 on reader service card.

NEW

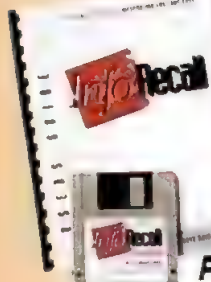
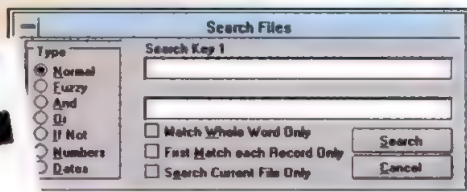
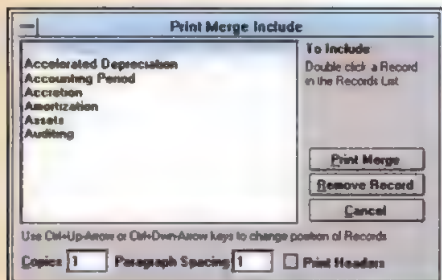
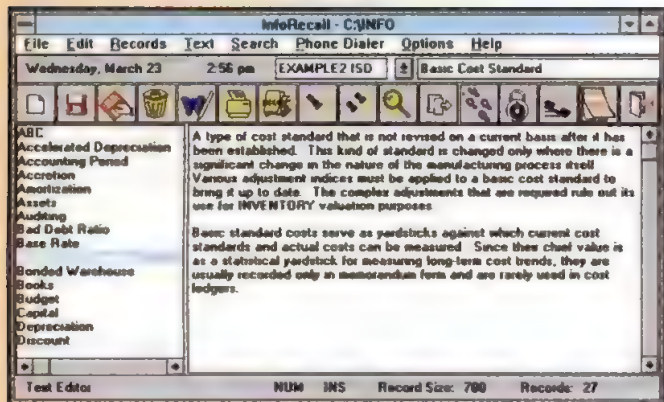
Adaptec's Altra Line for Your SCSI Setup

If anyone should know what you need in a SCSI adapter kit, **Adaptec** should. Therefore, the first two kits in the Altra line of SCSI-2 host adapter kits may come in handy as you add SCSI peripherals. The **TotalCD** kit contains the basics to connect a CD-ROM drive: the **AVA-1505** host adapter, an audio control utility, and Adaptec software for DOS and Windows. Meanwhile, **TotalConnect** will connect up to seven SCSI devices simultaneously including CD-ROM drives, Floptical drives, and scanners. This kit combines the **AVA-1515** host adapter and the Adaptec software but also adds

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With as many files or records as your hard disk can hold, **InfoRecall** will never tie you down!

Easy To Use.

It's really easy to use. We guarantee it! You'll be up and running in just a few minutes. If you don't have the time to learn a complicated package, **InfoRecall** is for you! Just turn it on, type a record name and type in some text or import text and you're on your way. And help is just a keystroke away. **InfoRecall** uses context-sensitive help throughout. Press a key and you get help directly related to what you're doing.

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InfoRecall supports not only links between text, but also between files in its hypertext-like environment to provide a robust multi-file access medium.

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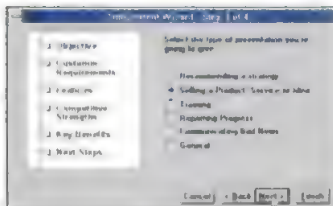
► **TotalCD.** List price: \$69. **TotalConnect.** List price: \$109. **Adaptec Inc.**, 691 S. Milpitas Blvd., Milpitas, CA 95035; 800-442-7274, 408-945-8600; fax, 408-262-2533.

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IMPROVED

Painless Professional Presentations from Microsoft

Microsoft Corp.'s PowerPoint 4.0 upgrades Version 3.0 with additional functionality, greater integration with other Microsoft products, and new usability features. By adding an AutoContent Wizard, the package now has



The AutoContent Wizard.

entire presentation templates tailored to appropriate styles, whether you are giving a sales pitch or presenting a status report.

Microsoft has made the help features flexible, so as you learn, you can shut off unwanted prompts. Version 4.0 also gives you greater control of all objects including multiple object resizing, the ability to rotate objects, and single-pixel object movement for precise object placement. PowerPoint is fully OLE 2.0-compliant for seamless integration with other programs in Microsoft's Office suite.

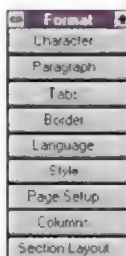
► **Microsoft PowerPoint 4.0 for Windows.** List price: \$495. **Microsoft Corp.**, One Microsoft Way, Redmond, WA 98052-6399; 800-426-9400, 206-882-8080; fax, 206-936-7329.

Circle 415 on reader service card.

IMPROVED

Hotwin 3.5 Windows Utility with DOS Enhancements

TMA Software's Hotwin is among the best Windows desktop replacement, Windows application launcher, and menu programs on the market. Hotwin 3.5, which can be automatically loaded as your shell, adds notable features to the existing product. Pull-down menus that you use often can be pulled away from the menu bar for quick access using the TearAway utility.



Hotwin's TearAway Utility

BRIEFS

Entertainment

Gallaticom's Entertainment Collection add-on for the well known bulletin board system (BBS) software, The Major BBS, has a new feature called ChatLink that allows your BBS to have interactive chat sessions similar to those on other on-line services. Currently, Gallaticom says there are over 6,000 users across America who have access to ChatLink, so now even local BBS operators can have a national chat area. The Entertainment Collection is priced at \$249. 800-328-1128, 305-583-5990

SimCity 2000 Scenarios, Vol. 1: Great Disasters (\$17.95), the first in a series of add-ons from **Maxis**, is sure to shake up your virtual communities. Now you can wreak havoc on your creations by recreating factual and fantasy disasters from ten different American cities including earthquakes in San Francisco and rioting lawyers in Washington D.C. 800-336-2946, 510-254-9700.

And Finally...

Mobile Telecommunications Technologies Corp. and **Microsoft Corp.** have announced the joint development of a nationwide two-way wireless network, which will be called a Personal Communications Service (PCS) network. . . Meanwhile, the **Internet Anywhere Consortium** is developing software and hardware systems to allow wireless access to the Internet. . . **AT&T, MCI, and Sun Solutions** were among seven companies who recently joined the Consortium for Audiographic Teleconferencing Standards (CATS), bringing total membership to 25 companies. . . Patent number 5,291,546 goes to **Brooktrout Technology** for its right to use Direct Inward Dialing telephone services to route faxes to computer-based workstations on a LAN. **Quarter-Inch-Cartridge** drives have reached an installed base of over 10 million units, making it the clear market leader in tape backup drives. . . **AccessAbility Technologies** has released 20 and 40 cell braille displays; for information call 818-981-2253.

Hotwin also tackles DOS enhancements, which make it possible for you to launch Windows applications from the DOS command line, close DOS sessions using ALT+F4, and allow the Windows screen saver to work with DOS. The package also can display and launch programs from a special menu which lists the ten packages you've used most recently.

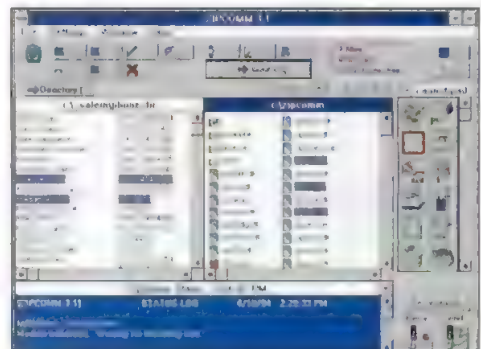
► **Hotwin 3.5.** List price: \$79.95. **TMA Software**, 1155 Camino Del Mar, #457, Del Mar, CA 92014; 800-497-3617, 619-792-1481; fax, 619-792-1781.

Circle 416 on reader service card.

NEW

Comm Software that Works for You, Not Against You

Media Point has released its first communications software, **ZipComm 3.1**, which combines fax and data communications functions within a single Windows interface. If you transmit between two ZipComm packages, the software will give you e-mail functionality and take



ZipComm's interface lets you control more than just communications.

care of all the dreaded transmission protocol hassles.

ZipComm has a built-in File Manager that is surrounded by a phone book window and icons for communications commands so you can send files by pointing and clicking. The program runs in the background, creates a modem log, and allows you to schedule transmission times. If you connect using two ZipComm packages directly you'll get some added benefits: The software will automatically optimize protocol configuration for fastest data transfer (eliminating modem initialization process), you can send binary files, and you can remotely access your PC while on the road.

► **ZipComm 3.1.** List price: \$179; **Media Point Inc.**, P.O. Box 3039, Alhambra, CA 91803; 800-783-6355, 818-281-1599; fax, 818-300-0925.

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Read Only

REVIEWS OF THE LATEST BOOKS FOR THE PC USER

Edited by Tin Albano

It's Nice to Have a Friend Who Knows About PCs...

BY BRAD GRIMES

Nick Sullivan, senior editor of *Home Office Computing*, has his staff to thank for a lot of the information that went into *Computer Power for Your Small Business*. Without going into much detail on any single subject, Sullivan's book delivers practical advice on how a PC works and how a wide variety of applications can make your life easier. It's ostensibly a book for small-business owners, but the wealth of information inside is useful for anyone who wants to discover the possibilities of personal computing.

Computer Power starts at the beginning by weighing Apple Macintosh computers against DOS/Windows-based PCs. Then the author talks about almost every computer task you can think of and recommends applications to perform it. Even networking gets a brief mention, though you might never network two PCs at home.

The book covers such subjects as business planning, forecasting, and project managing; it also touches on the relative features of word processors and presentation graphics programs that are used to produce newsletters, presentations, and reports. There's advice on fonts, clip

art, and scanned images as well.

For managing your home office, Sullivan discusses contact managers, personal information managers, and databases. The communications section of *Computer Power* is an excellent,

basic approach to getting productivity out of a sometimes scary type of application. It contains information on how to connect your PC to telephone lines in order to send faxes or receive voice mail.

At the end of every section is a brief overview of the applications discussed, including the average costs of such programs and descriptions of their learning curves. Sullivan then recommends a number of software packages for both DOS/Windows-based and Macintosh computers. The book comes with Andrew Tobias's *Managing Your Money* for DOS 9.0 and provides tips on how to best use the program.

While the book offers a lot of explanation (for instance, on how flat-file and relational databases compare and on how HP LaserJet, PostScript, and TrueType fonts differ), it has little hands-on, how-to information. The only substantial guidance

deals with the bundled software.

Think of *Computer Power* as a friend that offers sound advice on a wide variety of computer-related topics without going into much complicated detail. When you're done with it, you'll be a jack-of-all-trades but a master of

none—a good start when you're computing at home.

► **Computer Power for Your Small Business**, by Nick Sullivan, \$45.00. Random House Electronic Publishing, 800-733-3000. ISBN: 0-679-74645-5.

Circle 442 on reader service card

...And Is a Good Companion.

BY BRAD GRIMES

The *Business Software Companion*, by Tom Badgett and Corey Sandler, and the *DOS, WordPerfect & Lotus Office Companion*, by Robert W. Harris, are both "companion" books but have decidedly different uses.

The *Software Companion* is a task-oriented reference book. If you want to use macros in your spreadsheet program, you look up *macros* in the spreadsheet section and the book gives the appropriate instructions for Microsoft

Excel, Lotus 1-2-3 for DOS and Windows, and Quattro Pro for DOS. The directions guide you through every keystroke and menu selection, and there are also helpful screen shots and tips. The book also covers the three leading word processors, three database programs, and two communications programs.

Badgett and Sandler have taken the best, most useful information from the instruction

manuals and made it easy to navigate.

The *DOS, WordPerfect & Lotus Office Companion* is perfect for PC users who have resisted the move to Windows and remained loyal to DOS-based

word processors and spreadsheets. Updated to include Version 6.0 of MS-DOS and Version 6.0 of WordPerfect, the *Office Companion* contains all the pertinent information from each product's manual, written in easy-to-understand terms.

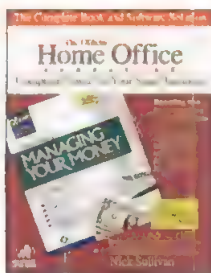
As you go through the book learning about the basic functions of the programs as well as their advanced applications, you encounter Hands-On sections that encourage you to practice your new skills on your PC.

► **Business Software Companion**, by Tom Badgett and Corey Sandler, \$22.95. John Wiley & Sons, 800-225-5945. ISBN: 0-471-56940-2.

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► **DOS, WordPerfect & Lotus Office Companion (3rd Edition)**, by Robert W. Harris, \$21.95. Ventana Press, 800-743-5369. ISBN: 1-56604-048-5.

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Read Only Recommends

Jeff Prosser's *Windows Desktop Utilities* is more than just a collection of ten new Windows utilities. You also get the accompanying C source code so you can see how he wrote them. \$34.95; Ziff-Davis Press, 800-688-0488; ISBN: 1-56276-098-X.

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Michael J. Miller

Endgame? Hardly.

For a while, it seemed as if you couldn't pick up the paper without reading about the consolidation of two or more computer software companies. It's been all over the news, but if for some reason you've missed it, here's a quick recap: Electronic Arts has

agreed to buy Broderbund, Adobe has agreed to buy Aldus, Novell is buying WordPerfect Corp. as well as Borland's Quattro Pro business, and Symantec has set its sights on Central Point Software.

Lots of analysts and news reporters look at what's going on and conclude that the consolidation of these companies proves that there's no room left in the market for smaller companies, which in turn means no room for innovation. The game is over.

The same type of chatter is heard on the PC side of the business. The big companies—the Compaqs and the IBMs—have gotten bigger, taking market share away from their smaller rivals and stunting innovation. Again, conventional wisdom claims that the game is over.

NO NEED FOR CONCERN

Conventional wisdom is dead wrong. The reason that it's way off the mark is that it's missing the fundamental truth of the computer business: Things always change, and this change happens very rapidly. In fact, this is the fastest-changing business the world has ever seen. Every 18 months we have twice as much computer processing power available. This demands growth and innovation.

We all know that's true. Just last year, a 66-MHz 486/DX2-based PC was the fastest machine you could get your hands on. It was the high end of the PC market. By the end of this year, it will be the entry-level machine. The game's not over, but the rules of the game are changing once again.

Let's look at what's going on. A personal computer used to be primarily a processing machine; it was used to do word processing and number processing. That's changed. Today, a PC is also becoming a major communications tool. Elec-

tronic mail is part of our lives. LANs are part of our lives. Enterprise-wide WANs are growing at an amazing rate. Soon we will all be connected not only to our own companies, but to our suppliers and customers as well. Eventually we'll all be linked up to everyone else. This will open up lots of new opportunities because it will change—in fact, it is changing—the way we work.

ANOTHER NEW GAME

The issue you hold in your hands contains our look at “groupware” products—networked applications designed to help people in business work together. But as you can see, this isn't just one category of software. We have group discussion packages, whiteboard software, video conferencing software, and document management, image management, meeting management, and workflow products.

As we've delved into this blossoming software niche, we've come across hundreds of new products, many of which we've never looked at before. As far as the market is concerned, the list of categories (or types of groupware) hasn't yet been set, so it's anyone's guess who the winners are going to be. This means that

there's a lot of opportunity for both large and small companies to grow. And it means there's going to be a lot of opportunity for the hardware, systems software, management tools, and peripherals that will make all of this work.

LOOK HOMEWARD

Go all the way to the other end of the computing spectrum and take a peek at the future of the home market. Before you know it, you're seeing home sales of PCs really growing because the personal computer is really becoming *personal* again. You're seeing new kinds of



The rapid growth of the PC industry is far from over. The future is ripe for innovation and change.

Michael J. Miller

education and entertainment software. You're seeing people at home doing things with computers you've never seen before.

We don't know where all of this is going to lead; no one can really imagine what the software of the future will look like. One thing, however, is certain: The continual advancements that will change the way we work will also pervade the home market and change the way we think about and use a PC in our homes. More and more, people will begin using their home PCs for communication, education, and entertainment purposes.

Look on the hardware side of things. If you think you don't need high-end processing power at home, then you haven't tried the new multimedia education and entertainment packages. Some of these programs make Pentium-class machines seem slow. As software gets even more sophisticated, we will undoubtedly find ourselves wanting a whole lot more processing power.

Then imagine what happens when homes become hooked up into a nationwide information network, and everybody at home has access to all kinds of information. No one knows for sure what customers will really want, or what kinds of niches are going to be available. This leads to more opportunity, more innovation.

Even in something that is supposedly as static as business software, where you might think that Microsoft, Lotus, and Novell have a lock—though I don't think that's necessarily true—we have a lot of new technology coming. OLE, OpenDoc, Taligent Frameworks, and the like are all designed to let developers create and combine smaller software components. So we're starting to hear about the "dis-integration" of software. We're now seeing applications like Visio Express, an inexpensive component that adds drawing tools and looks just like Microsoft Office. We will see many more such components, designed to work with Microsoft's, Lotus's, and Novell's office suites. Lots of companies are working on add-ons and products designed to work with network platforms, such as Lotus Notes and Novell's AppWare.

THE FUTURE'S A PLEASANT QUEST

Let's look around once more: Today we have more processing power than ever before, and we're going to get more. We have more networking than ever before, and we're going to get a lot more. We have more software services than ever before, and we're going to get a whole lot more as we begin to use multitasking, multithreaded, 32-bit operating systems. The new technology invites new innovation to exploit it.

With over 100 million PCs out there today, and that number growing tremendously every year, even a little product can become a big product fairly easily. I look at the technology that's coming and see possibilities for dozens of new applications and new companies. Across the whole spectrum, whether you talk about the networking market, the home market, or the business applications market, there's plenty of opportunities left for companies of all sizes.

That's good news for all of us who use computers. We've come a long way in the PC revolution, and it's far from over. We want, we need, and I believe we'll get more innovation in both hardware and software in the years to come. Some may say the game is over, but I say it's really just beginning. □

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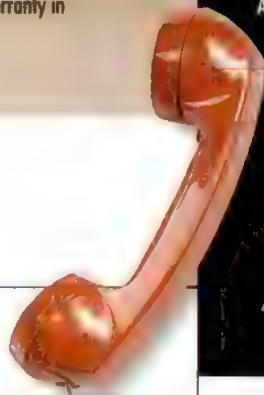
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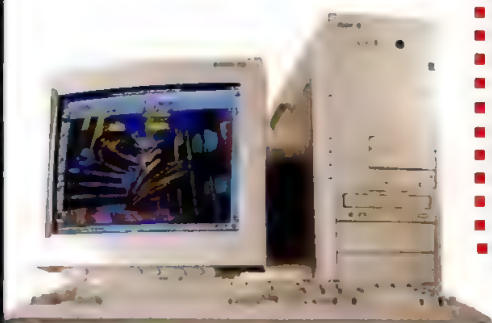
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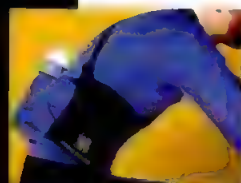
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CIRCLE 093 ON READER SERVICE CARD



Bill Machrone

Privacy in the Digital Age

I'm a fairly conservative, law-and-order kind of guy. I support my local police. I sometimes have trouble identifying with some of my more liberal journalistic compatriots. But suddenly, you and I (along with the rest of the computer industry) are caught up in

an issue of national importance that transcends politics and gets down to constitutional issues and basic freedoms. The issues, however, are in danger of being clouded as the usual suspects take sides and start shouting.

The knee-jerk liberals have squared off against the knee-jerk conservatives over the privacy and security of digital communications. The Electronic Frontier Foundation and the Computer Professionals for Social Responsibility oppose the FBI and the Justice Department. And they're all quoting Al Gore. Let's get beyond the labels, politics, and allegiances and look at the facts.

Here's the short form: The Feds realized that with the advent of widespread digital communications, their ability to monitor and tap communications would be radically diminished or would take far more time and money. So they proposed that all future digital devices be equipped with a high-security scrambling chip, called Clipper. Crazy? Like a fox. Every Clipper chip would have a serial number, which would give you access to a key that would decrypt whatever data the chip had encoded. The key would be kept in two pieces in two different places, and only a court order could bring them together. Trouble is, nobody trusts the law enforcement agencies to keep them apart. Don't even wonder whether the National Security Agency will be monitoring digital conversations for its favorite trigger words. Furthermore, the pending legislation provides for fines of up to \$10,000 a day against telecommunications companies who don't give the Feds the access they want to the decoded data streams.

It doesn't end with telephones and data networks. The Feds intend to have Clipper technology on

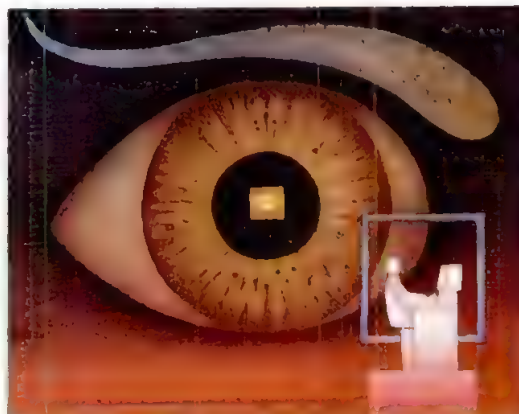
every fax machine, every cable TV box, every ATM, every device capable of receiving and sending a digital data stream. They want to monitor the entire information network for "patterns of abuse and criminal activity."

Offering this capability in the form of a "security" chip that supposedly protects our data is insulting and offensive. The silly part of all this is that it represents the classic case of locks keeping out the honest people. The sad part is that we don't trust law enforcement agencies, however well-intentioned, not to abuse the power. Even worse, we the taxpayers are going to foot the bill (to the tune of half a billion dollars) just to build the monitoring network. We'll pay again in higher product costs. Nobody builds complex data-encryption chips for free.

There is this little issue, however, of First Amendment rights. When the White House issued its briefing document on the Clipper announcement, it averred that no U.S. citizen, "as a matter of right, is entitled to an unbreakable commercial encryption product." FBI director Louis J. Freeh echoed this position in a *New York Times* interview, in which he claimed that the American people must be willing to give up a degree of personal privacy in exchange for safety and security. I find both statements odious.

Privacy is a nonissue for most of us. People who want their communications to be secure have always had the means to do so. People who don't need secure communications don't bother and don't care. Also, security is a pain in the neck. The inherent hassles make us very choosy about when we use it. All the Clipper chip will do is waste our tax money.

There's no point in making everyone's transmissions and conversations secure if a third party holds the key. No criminal in his right mind would depend on



*If encryption is outlawed, only
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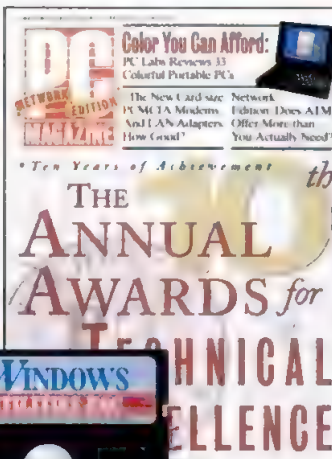
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Bill Machrone

Clipper encoding when fully secure means are available.

If the government manages to overthrow all logic and make Clipper a legal requirement, those of us who want or need real security will be forced into acts of civil disobedience. For data, it's a piece of cake. You can find half a dozen shareware programs on ZiffNet that implement the National Institute of Standards and Technology's Data Encryption Standard (DES). If you're one of the superparanoids who suspect that the NSA put a trap door into DES—no one has ever found evidence of it—you can use PGP (Pretty Good Privacy), a shareware program popular on the Internet, or PC-IRIS, available on ZiffNet. Both use a technique known as RSA to encrypt your data, which is widely regarded as extremely difficult to break. RSA has the additional benefit of providing public-key encryption; you publish a key that people use to encode messages to you, and then you use a private key to decrypt the message. DES is probably only viable for another year or two before it becomes too easy to crack; RSA should be secure for some time longer.

Voice security is harder, but not much. You either go to a spook shop and pay a lot of money for a telephone scrambler device or build your own. The latter option is not all that difficult, given the advent of DSP (digital signal processing) chips. All you need is the DSP, a couple of megs of memory, and a few support chips. Some of the DSP vendors have evaluation kits that contain virtually everything you need. Basically, you digitize your voice, take samples of the data, and perform calculations and transformations on it. You then turn the resulting data stream back into sound and send it over the phone line. For fun, you might send several data streams at the same time but out of phase with one another, the way modems do. An identical piece of hardware on the other end performs the operations in reverse order. Suffice it to say, however, that if the NSA types hear a scrambled conversation that they can't understand, they're going to wonder what you've got to hide.

We're not encouraging criminal behavior by pointing out cryptographic resources. The dummies won't read this and the smarties don't need to. The only people who will be adversely affected by Clipper are you and me. □



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“The Cyrix Cx486SRx² 386SX upgrade chip cleverly does something which everyone thought was impossible...a single-chip upgrade for 386SX machines..”

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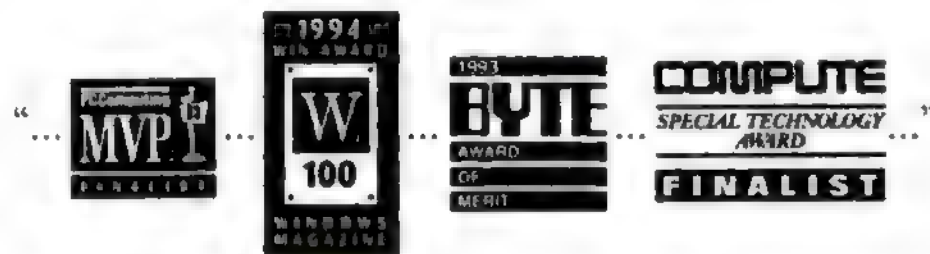
—Personal Computer Magazine (UK), November 1993

“Simply plug in the Cyrix 486 upgrade to a 386 motherboard and you'll crank up performance by better than 60%..”

—PC Computing November 1993²

“Cyrix has developed inexpensive upgrade chips for 386-class personal computers...and the effect will be like dropping a Corvette engine into a Ford Escort... We decided to try one of the Cyrix chips. The result was impressive...Think about how much a small company could save.”

—Barry Cooper, The Orlando Sentinel, February 10, 1994



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—Computer, November 1993, IEEE Computer Society

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—WordPerfect the Magazine,
December 1993

"...Cyrix gives new life to older 386SX- and 386DX-based computers...This may be the best upgrade solution we've seen yet for users of older machines who don't want to shell out \$1,500 or more to move into a new 486-based system."

—Windows Magazine, The Win 100:
The Best Windows Products of the Year,
February 1994¹

"Performing an upgrade on a full-size Toshiba laptop computer required less than two minutes...The system booted without problem and showed dramatic improvements in overall computational performance and disk I/O."

—Computer Reseller News,
Joel Shore, August 16, 1993

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—PC Magazine, October 13, 1993²

"...The performance increase was significantly greater even than what the ad claimed... And the performance bang for the buck—mamma mia! Went through the roof!"

—Raw Bytes, Frank Delaney
KPBX FM 91.1,
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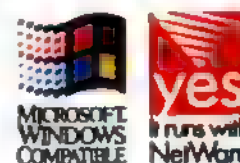
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CIRCLE 038 ON READER SERVICE CARD



John C. Dvorak

Balls of Fire

The prognosticators who predicted that software companies would merge into three or four monster entities, just as the automakers did, were right. Let's look at the situation.

So far Novell has sucked up WordPerfect Corp. and, before

that, Digital Research. It also bought Quattro Pro from Borland and will distribute 1 million copies of Paradox. This may (1) make Paradox the most popular database by seeding market share, (2) cheapen the value of Paradox, or (3) kill Borland's hoped-for cash cow, dBASE IV for Windows.

Whatever the case, it looks like another defeat for Borland, which appears to be losing its legal battle with Lotus. Much of the cash generated by the sale of Quattro Pro is expected to go straight to Lotus. Wouldn't it be ironic if the old merger between Lotus and Novell were still in the works? Borland pays off Lotus, and then Lotus ends up with Quattro Pro anyway. Pretty funny, huh? Anyway, Novell isn't support-oriented like WordPerfect or marketing-oriented like Borland. I sense that all these products will languish even when bundled.

Microsoft. Microsoft has been buying little companies all the while, never paying too much, except perhaps for Fox Software. It has the hottest bundle on the market—Microsoft Office—and it looks as if others have to consolidate to compete. Microsoft is still under antitrust investigation, though, and could always wind up broken into pieces.

Computer Associates. The original software conglomerate that bought little companies like Sorcim (remember SuperCalc?) is now a \$2 billion company. But you have to wonder how big it'd be if it were managed like Microsoft. Computer Associates hasn't a clue about brand names. Many of its products can't be named by the average user.

Borland (see *Novell*, above). Borland went the acquisition route when it bought (or merged with) Ashton-Tate for too much money. As they say in Alabama, they tried to drill with too big an auger. The

irony is that the company has a natural merger partner in Symantec, which I suspect is a takeover target. Unfortunately, CEO Philippe Kahn burned his bridges by insisting that Symantec's Gordon Eubanks be deemed a felon for allegedly stealing one of Borland's employees. This bad blood will prevent the merger until Philippe either is ousted or quits. Until something good happens to strengthen Borland, this company looks like somebody's acquisition. But whose?

Lotus. "If I only had a brain" should be the nickname of these lucky folks. Riding high on the Lotus Notes craze, the company looks solid. It has what most observers say is the best word processor on the market, AmiPro. It's got a top spreadsheet and the only viable groupware product. Personally, I find Lotus Notes a cumbersome mess of a product. I'll root for Microsoft if it can come up with something better. But Lotus is still weak in many departments and can be boxed in by the likes of Novell and Microsoft. On the other hand, Lotus has fooled IBM into thinking it's part of the IBM team. If IBM retakes the lead in operating systems, then Lotus is in great shape. A merger with Borland might be interesting, too—but again, bad blood.

Adobe. Here's the sleeper in the group. After a stock swap to merge with Aldus, Adobe owns the high-end graphics professional market for page layout, illustration, photo retouching, and font technology—a high-profit, no-competition market. A lot of high fives were exchanged at Adobe HQ. I'm sure.

Few of these players can do more than buy up little companies and put their own programmers to work tweaking old products. Nothing really new comes out of these big firms any more. It does sound like the auto industry, doesn't it? □



As the software companies merge, who's riding high and who's a takeover target?



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Inside Track

T

he **90-MHz Pentium**. Here's a chip that crept up on everyone. Originally dubbed the 54C, this is a 3.3-volt chip using the **new 0.6-micron technology**. Seven new machines have already been released using the 90-MHz version of the chip, which shipped a month earlier than expected. Intel is really going to make it rough on the competition with this thing.

The chip comes in **90-MHz and 100-MHz** flavors, but nobody has seen the 100-MHz chip. I suspect that the 90s are just rejected 100s and it will be a while before the 100-MHz chip ships in quantity. The 90 is a screamer though. The machine is so fast that potential buyers now have to deal with a **new term: synchronous SRAM**. This type of static RAM allows a faster data stream to pass through the cache. Machines using synchronous SRAM are the ones that will win the benchmark tests. It will soon crop up as a marketing term. Just watch.

Meanwhile, Intel is slipstreaming its **new version of the PCI bus** into systems out there. Code-named Neptune, it's a 3.3-volt system that novices are likely to identify by the fact that the machines using it will be Energy Star-compliant. If you're **worried** about your machine using the older, buggy PCI bus (called Mercury), you can look at the motherboard and try to identify the PCI chips. The suffix for Mercury chips is "LX", for Neptune chips "NX." **Look for the 82434NX and the 82433NX chips** in the machine and you can be assured you have the latest and greatest. They hate it when I publish stuff like this.

While on the Subject of Chips Dept.: Look for ESS—the Fremont company that makes the chips for the Disney Sound Source and other inexpensive sound generators—to roll out a **one-chip-does-all sound solution** that will be picked up by Compaq and other computer makers that have yearned for a **one-chip-does-all motherboard-based sound system** for the PC. The ESS 1688 will run with Sound Blaster and Sound Blaster Pro and will act as a 16-bit 44-kHz DAC for sound sampling. Looks like the **buzz-saw sounds of FM synthesis** are here to stay.

Here's an interesting anomaly: IBM has sold 4 million copies of OS/2. Applications developers shun the operating system because the market is too small. Meanwhile, and coincidentally, there are 4 million CD-ROM drives out there and developers have **gone nuts**. Everyone is creating a CD-ROM. And the press is **bonkers** as

*A rumor crosses my desk
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it promotes the CD-ROM phenomenon. Sheesh! CD-ROMs have been out for a decade. A recent online article raves about how CD-ROM sales are booming. 4 million disks were sold in the last quarter, according to the Software Publishers Association. At this rate of sales, a CD-ROM owner will buy an average of 4 disks a year. So are people buying 4 applications per year for OS/2? They might be, but who's making a fuss? They say the three keys to retailing are location, location, location. **The three keys to success in high-tech marketing are perception, perception, perception.** My advice to IBM: Get some.

Of course, the CD-ROM phenomenon is marking a slight change

in the direction of software marketing. Until recently, content-based software has been in the **backseat** while functional (or what I like to call robotic) software has dominated the scene. These are programs such as **WordPerfect or Excel** that do work for you (as a robot would). Meanwhile, a database full of facts that one can use to find a phone number, for example, has been difficult to sell. But this is the perfect vehicle for CD-ROMs. I collect CD-ROMs that have the most data. A CD-ROM full of books and magazine articles is invaluable.

I like a CD-ROM just full of raw searchable text, but I appreciate the fancier approaches too. An example is the **Job-Power Source Multimedia CD-ROM** from InfoBusiness Inc. (887 S. Orem Blvd., Orem, UT 84058; phone, 801-221-1100; fax, 801-221-1194). This \$49.95 CD-ROM is for the unemployed person who has a multimedia machine—an odd and **unlikely** combination. Anyway, on the disk are 11 best-selling books on career development, the complete U.S. Department of Labor Occupational Outlook Handbook, two hours of video clips, a few hundred letters you can use to get job leads and more. This is a good use of the technology!

So a rumor crosses my desk saying that IBM is going to buy out Borland. Apparently this is for the top-notch language technology at Borland. I pass on the rumor, figuring that it would take IBM too many **years** to sign off on the deal and that there's no chance of it ever happening. Still, it's an interesting concept.

More Crazy Mistakes Dept.: Drew Spencer dug up another funny anecdote. "The software inside the computer can be as befuddling as the computer itself. A Dell customer called to say he couldn't get his computer to fax anything. After 40 minutes of troubleshooting, the technician discovered the man was trying to fax a piece of paper by holding it in front of the monitor screen and hitting the Send key." Good one. □



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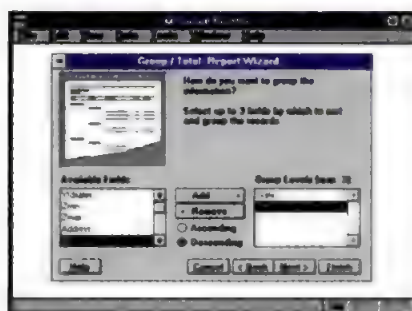
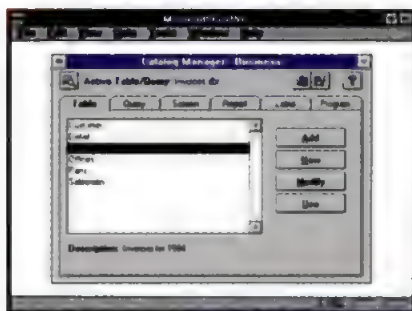
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Jim Seymour

Not *How*, But *What*

Good new ideas, as I've said here before, are not exactly a dime a dozen in the PC business. To be sure, tens of thousands of new features have appeared in PC software over the past decade, hyped as nifty implementations of great ideas, but features and ideas are two very different things.

A decade of this manic emphasis on ever more features may finally be over. Today, as Michael Miller said in a recent *PC Magazine* column ("The Myth of Usability," April 12, 1994), the new buzzword is *usability*.

The megabucks spent so far by the software industry on usability research and testing have produced lots of tweaks in applications but few fundamentally new ideas. So few, in fact, that the really good ideas in the business shine like beacons on a distant shore.

When everything works the way it's supposed to, these good new ideas get refined and further developed in successive releases of the products that originally implemented them. They are then shared with their sibling products, too.

Case in point: Microsoft's Wizards. Microsoft first used Wizards in its consumer products beginning with the initial release of Microsoft Publisher. In that first release, a series of Wizard screens appeared when you began a new document and asked some basic questions about how you wanted the document to look. When the program had enough information, it created a document shell, or template, according to your specs. You then fleshed out that template with your own thoughts and words.

It was a nice idea, impressive at first. But with repeated use, Publisher's relatively primitive implementation of the idea wore thin. And though Microsoft later enriched Wizards in Publisher 2.0, the notion didn't seem very important anymore.

Microsoft quickly brought Wizards to other products—most notably, Word for Windows 6.0, which uses very good Wizards to help build such documents as fancy award certificates.

Still, in both of these products Wizards focused on *how*, not *what*, you wanted to do. This really meant that you had to bring to the job a pretty well worked-out vision of what you intended to accomplish.

HELP WITH THE WHAT

In Microsoft PowerPoint, Version 4.0, Microsoft has now pushed the idea of Wizards into another dimension; these Wizards help us with the *whats*, not just the *hows*. In the process, we've passed a small but critical milestone in our use of computers.

When you launch PowerPoint 4.0, it asks whether you want to create a new presentation or open an existing one. If your answer is "new," the package offers the new AutoContent Wizard. That's AutoContent, not just AutoMakeItPretty. A series of screens then asks what you'll be talking about and for your name (which it remembers from installation and fills in for you) so it can produce a title slide.

Then the AutoContent Wizard gets very smart. It asks what kind of presentation you're going to be making, such as a presentation Reporting Progress, Recommending a Strategy, or Communicating Bad News. For each of these presentation types, it displays a group of recommended slide topics, in order of appearance, that will help convey your message. For Recommending a Strategy, for example, PowerPoint proposes as slides a Vision Statement, a list of Goals and Objectives, a summary of Today's Situation, a review of How Did We Get Here, a list of the Available Options, and finally a list of Recommendations.

Choose one of the presentation type categories and PowerPoint goes off to build an outline for you, using the slide topics it rec-



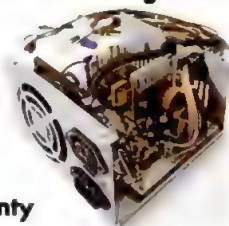
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Jim Seymour

ommended. Each main item in that outline is the title of a slide, with the subordinate items used as bullet points on the named slides. And as with most presentation programs, you can flip back and forth between the outline and graphical views of the slides themselves with a quick click.

By simply clicking in the placeholder text in the outline view, or directly in that same text on each slide, you fill in the blanks with your own information. It's easy to expand the show by adding slides and to expand single slides by adding items to them, though often that won't be necessary since the idea is total automation.

ADDRESSING A BASIC FEAR

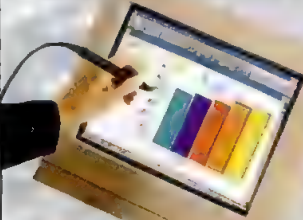
The magic here is that Microsoft has addressed a basic fear shared by users of all presentation graphics packages: How do I put this show together? Manuals focus on how to use the software, not on how to organize the presentation itself. As a consequence, many users of these programs, even experienced ones, still tense up when they sit down in front of a blank screen. They know all about how to use templates and paste-in logos; what they *don't* know is how to organize the material in the presentation. They think: What do I need to include? In what order should I put it? Where should I be placing the emphasis?

As a result of that fear and confusion, we sit through (and maybe ourselves deliver) many otherwise very slick PC-based presentations that skip over critical points, such as defining the problem, assessing alternatives, and listing recommendations. That's like a salesman making a great pitch but forgetting to ask for the order.

I suspect Microsoft will get some harsh comments on the AutoContent Wizard in PowerPoint 4.0. Some reviewers will carp that any list of possible types of presentations is always too limited, and that all this will lead to canned presentations.

Of course! But Microsoft's well-chosen list of presentation types gives users a jump-start, and most computer slide-show presentations *are* canned. Their structure arises from the situation, not from limited vision.

The AutoContent Wizard is a big step forward, dragging our use of PCs into the realm of *what* we want to do, not merely *how*. It's a good idea that should spread like wildfire. □



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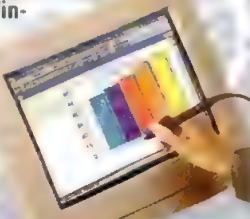
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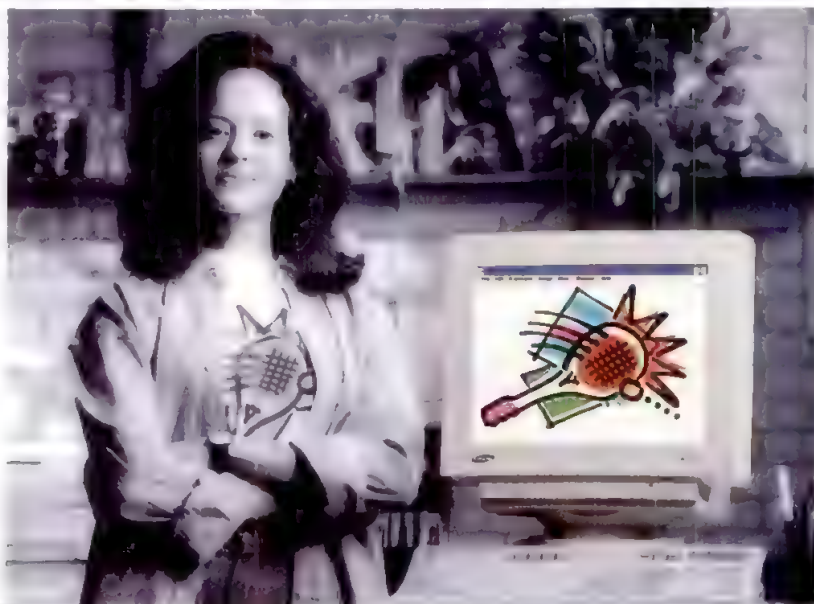
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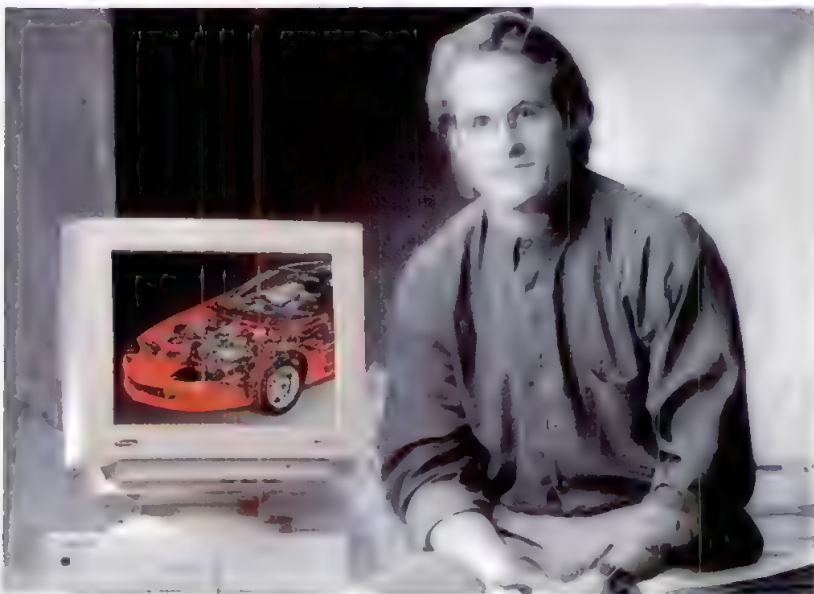
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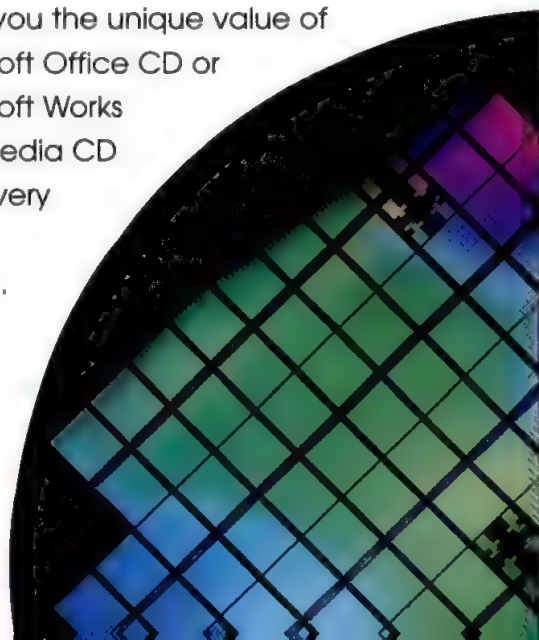
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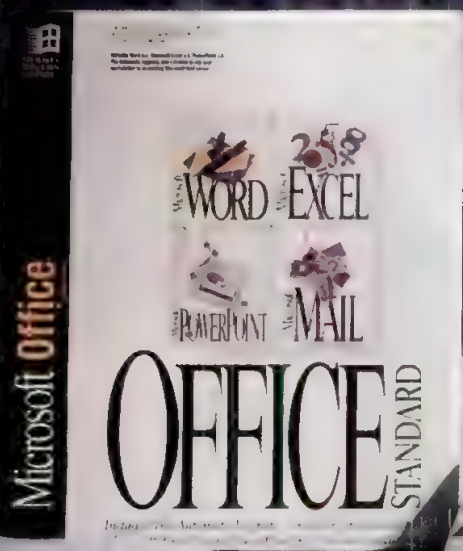
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- 8MB RAM (expandable to 64MB)
- 420MB 14ms IDE hard drive (VLB)
- 256K write-back cache, Flash BIOS
- 7 expansion slots: 2 VESA, 7 ISA
- 2X CD-ROM drive, 3.5" floppy drive
- Diamond SpeedStar Pro VLB (1MB)
- 15" Micron 15FGx, 1280NI, .28mm, MPRII
- Desktop "Tool Free" chassis
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- Intel DX4 100MHz processor
- Pentium Technology Ready (ZIF)
- 8MB RAM (expandable to 64MB)
- 420MB 14ms IDE hard drive (PCI)
- 256K write-back cache, Flash BIOS
- 4 ISA, 2 PCI, 1 ISA/PCI slots
- 2X CD-ROM drive, 3.5" floppy drive
- PCI graphics accelerator (2MB)
- 15" Micron 15FGx, 1280NI, .28mm, MPRII
- Desktop "Tool Free" chassis
- Microsoft Mouse, 101-key keyboard
- MS-DOS & Windows for Workgroups
- Microsoft Works Multimedia on CD*

\$2,499 LEASE - \$88/MO.

P66PCI POWERSTATION

- Intel 66MHz Pentium processor
- 8MB RAM (expandable to 128MB)
- 420MB 14ms IDE hard drive (PCI)
- 256K write-back cache, Flash BIOS
- 4 ISA, 2PCI, 1 ISA/PCI slots
- 2X CD-ROM drive, 3.5" floppy drive
- PCI graphics accelerator (2MB)
- 15" Micron 15FGx, 1280NI, .28mm, MPRII
- Desktop "Tool Free" chassis, 3 cooling fans
- Microsoft Mouse, 101-key keyboard
- MS-DOS & Windows for Workgroups
- Microsoft Office 4.2 on CD*

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P66PCI POWERSERVER

- Intel 66MHz Pentium processor
- 16MB RAM (expandable to 192MB)
- 512K write-back cache, Flash BIOS
- 527MB 12ms SCSI-2 hard drive
- PCI 32-bit Fast SCSI-2 controller
- 5 EISA, 2PCI, 1 EISA/PCI slots
- 2X SCSI-2 CD-ROM drive, 3.5" floppy
- PCI graphics accelerator (2MB)
- 14" Micron 14FG, 1024NI, .28mm, MPRII
- Tower: 10 drive bays, 3 cooling fans
- Microsoft Mouse, 101-key keyboard
- MS-DOS & Windows for Workgroups
- Microsoft Office 4.2 on CD*

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- 2X CD-ROM drive, 3.5" floppy drive
- Diamond SpeedStar Pro VLB (1MB)
- 14" Micron 14FG, 1024NI, .28mm, MPRII
- Desktop "Tool Free" chassis
- EPA Energy Star compliant
- Microsoft Mouse, 101-key keyboard
- MS-DOS & Windows for Workgroups
- Microsoft Works Multimedia on CD*

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- 527MB HD
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Bill Howard

The Little Drive Engine That Could

Conventional wisdom says that you buy an IDE interface when you want cheap, passable hard disk performance and capacity. But when you're ready to move up and play in the big leagues, you buy SCSI. Wrong! IDE, or integrated drive electronics, has

done a lot of growing up in the past few months. Everything you want you now can get from the new Enhanced IDE specification: faster throughput, larger storage capacity, and the ability to connect more than two hard disks and to connect CD-ROM and tape drives. Many PCs shipping currently, and many more in the near future, will come standard with Enhanced IDE.

NOT AS SEXY...

SCSI (small computer system interface) is getting easier to use and will be all but idiot-proof once Chicago (Microsoft Windows 4) ships with SCSI support built in, thereby eliminating the need for separate device drivers. Still, I believe that Enhanced IDE will be the right drive interface for the vast majority of desktop PC users—even desktop powermongers.

The premise behind IDE, which has been with us since 1986, was and is simple: Embed the drive controller electronics onto the drive itself (doing away with the separate disk controller), and attach the drive to a virtually no-cost motherboard connector or ISA slot. IDE hastened the demise of the low-performance ST-506 and moderately high-performance ESDI (enhanced small device interface) interfaces, leaving you with two choices: IDE or SCSI.

To take advantage of Enhanced IDE, you'll need a new BIOS. While you could upgrade the BIOS on an existing PC, Enhanced IDE will be of more interest to people acquiring new systems with new BIOSes and enhanced buses such as PCI or the VL-Bus.

With Enhanced IDE, you'll have the ability to go beyond today's 528MB IDE disk storage limit all the way up to 8.4GB. As a practical matter, that means you'll be able to get a fast, cheap 1GB IDE drive for about \$750.

...BUT JUST AS APPEALING

If you move IDE off the ISA bus, your maximum possible transfer rate bumps up well beyond 2MB or 3MB per second. The Mode 3 PIO (programmed input/output) Enhanced IDE specification allows transfers up to 11 MBps. That puts Enhanced IDE in competition with SCSI, Fast SCSI, and Fast-Wide SCSI, which have transfer specifications of 5 MBps, 10 MBps, and 20 MBps, respectively.

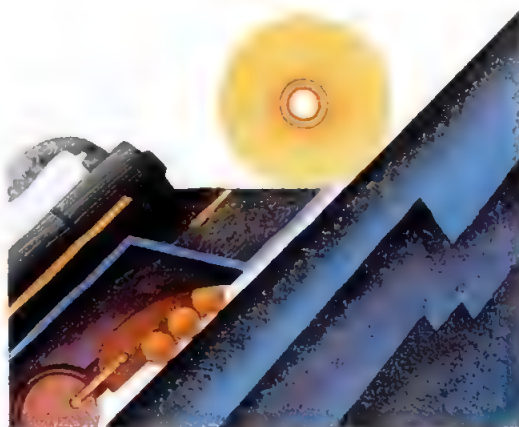
Regardless of theoretical maximum bus throughput, all the testing we've done at PC Magazine Labs and ZD Labs says even nonenhanced IDE outperforms SCSI by a slight amount for desktop users. SCSI chauvinists say this will change in a multitasking environment (such as Chicago) because multitasking is SCSI's forte. But we don't consider editing spreadsheets while fetching e-mail and printing in the background to be heavy-duty multitasking. Still, we'll keep an open mind.

A HARD CHOICE TO MAKE

SCSI, however, continues to make sense for many people: users who want to get beyond the 528MB storage limit with their existing systems, users who want to connect lots of I/O

devices, users who want to attach external devices and can't live with the IDE cable-length limit of 18 inches, and users with industrial-strength multitasking needs. File servers will still use SCSI heavily. And with vendors beginning to put SCSI on the motherboard, there isn't going to be much of a cost disadvantage.

Whether you specify IDE or SCSI as your next hard disk interface, you can't really go wrong. But if you're torn between the two, you've now got a little more ammunition to help you choose the less sexy solution: Enhanced IDE. □



New enhancements to IDE technology help boost an old friend up the performance mountain.

The Marriage.



The new Lexmark WinWriter™ 600 is the brain-child of Lexmark and the Microsoft Corporation. Which simply means it offers all the ease of use you expect from Windows, and the unsurpassed speed and quality of a Lexmark printer.

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your PC talk to each other, allowing helpful messages to be displayed on your screen. For example, you'll immediately know when a paper tray is empty or when the toner cartridge needs to be replaced.

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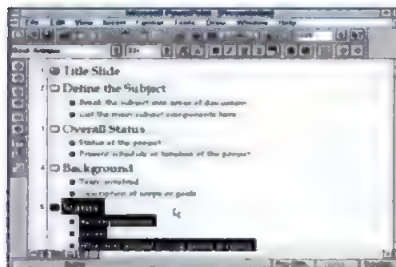
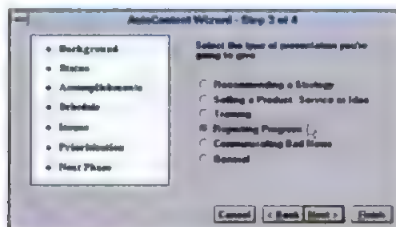
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Microsoft Office

The . *Changing* Office

For years, you've been hearing people talk about the "office of the future." In many ways, that promised future has already arrived. In this, a full issue devoted to examining the changing office, we take stock of what's possible right now, and what you're likely to see tomorrow. New software, new hardware, and new means of communications help us work together.

Everywhere you look, new technologies have changed the way people work. New applications have changed the way we share information and work on documents and send files to each other. New forms of electronic communications, from voice mail to fax to electronic mail, are now commonplace. You can communicate with people across town or across the country nearly as easily as you can with the person down the hall.

All of these new technologies and applications have changed the basic flow of information. In turn, that has changed the way our companies are organized. With new technology,

you can now communicate with surprising ease to remote offices in other time zones or in other countries. This makes it easier to do business around the world, which, in turn, fuels the forces pushing the globalization of business.

You can now communicate with your customers much more easily, making it possible to be much more responsive to their needs. You can communicate with your office pretty easily while traveling, which makes business travel more productive. You can even communicate with your office from home, which makes telecommuting a much more attractive alternative for you and your company.

By Michael J. Miller



Most importantly, the new communications technologies allow more people to share information with greater ease. This tends to disperse information throughout an organization, leading to more people being able to make better decisions. And because this makes it easier for people to communicate with top management, it tends to make for flatter organizations (that is, those with fewer levels of management), which are gaining in popularity.

In many organizations, this is all coming together as a belief that the time has come to use these technologies to change the basic way they work. Thus *reengineering* is a hot topic in business schools and boardrooms. But it is

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actually on computer networks that the real work is taking place. This comes in the form of mission-critical business applications and enterprisewide communications systems being established on PC-based local area and wide area networks instead of on mainframes and minicomputers.

The most important thing to note in all of this is that this process is just getting started. Newer developments coming through the technology pipeline promise not simply to add to the trend, but to accelerate it.

TURN, TURN, TURN

In this issue we take a considered look at the changing office—your new workplace. We begin here with an overview of the entire scene. We'll assess some of the fascinating technological prospects, such as telephony and cable connections (see "Calls from the Keyboard" and "Powerful Convergence" later in this story).

In the bulk of this issue, *PC Magazine* takes its standard labs-based look at several sets of currently available products that generally fall under the sweeping banner of *groupware*. We review workflow, document-management, image-management, conferencing, and electronic-meeting-support software packages, as well as hardware and software videoconferencing products.

We take you through the significant features of all of these new packages and how they all contribute to these new ways of working together. To make these groupware reviews even easier to navigate, we've created a flowchart for you to follow to find reviews of the products you need. (The flowchart appears within the groupware roundup "Group Enabled.")

Our Contributors: MICHAEL J. MILLER is editor-in-chief, FRANK J. DERFLER, JR., is senior networking editor, and ALFRED POOR is a contributing editor of *PC Magazine*. LUISA SIMONE is a frequent contributor to *PC Magazine*. BRENDON M. MACARAEG is an editorial researcher and ANDREW KANTOR is a staff editor at *PC Magazine*. GAIL SHAFFER was the associate editor in charge of this story.

PCs and LANs Gain Users . . .

By the end of 1994, more than half of the U.S. work force will have access to PCs.



Sources: Dataquest Inc., Computer Intelligence InfoCorp., U.S. Bureau of Labor Statistics.

* Estimated

We created the flowchart because no doubt you'll run into the same quandaries we did as we were categorizing products for this issue. It's hard to categorize groupware products because they share many overlapping features. It is part of what makes this new class of software what it is. So decide which functions you

need, then go to our flowchart in the groupware story for directions to hands-on reviews.

In the "Coping with Change" article we consider the strategies planned by several important vendors for applications and document and data handling to deliver you into the chang-

ing office. We think it's clear that as you choose applications for the coming years, you will be choosing a company's particular approach for handling your data, files, and documents.

PAY-PER-DATA

No doubt you've heard much of the hype about the coming "Information Super-

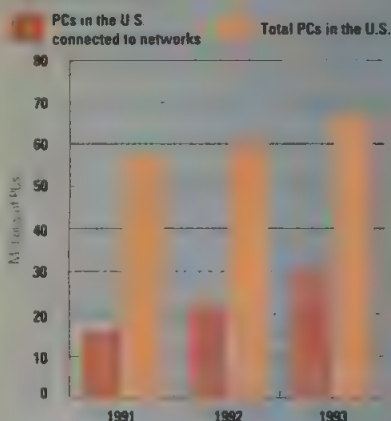
highway." This is an already tired metaphor for one vision of the idea that eventually all homes and businesses will be connected electronically and that all sorts of information will be available for downloading into your home or office PC. This could be anything ranging from public and private reports to pay-per-view movies. Exactly how this information will be delivered remains a major topic of debate.

With faster networks on the horizon, more connections between networks, and more services available, there is no question that new applications will change the way we use information, at the office as well as at home. Currently traditional telephone companies, long-distance carriers, cable-television providers, and public utilities are vying for the right to provide the lines that will deliver this kind of information.

In fact, all sorts of technologies—ranging from simple fiber-optic cable to ISDN (Integrated Services Digital Network) lines to new asynchronous transfer mode (ATM) networks—are being discussed as delivery mechanisms. The end result may well be a combination of all of the above. (The "Powerful Convergence" section of this article describes the various technologies.)

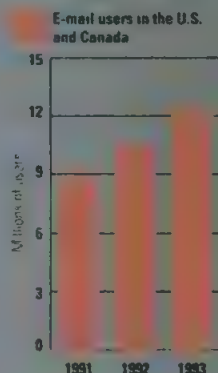
All sorts of companies are lining up to provide connections into your PC with setup devices that will allow televisions to access this information and servers in which the information will reside. For example, Microsoft and TCI have dis-

Nearly half of all PCs in the U.S. are connected to LANs.

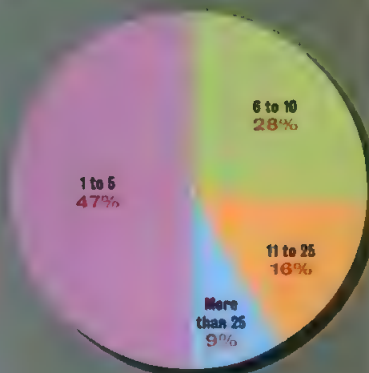


Source: International Data Corp.

Over 12 million people in the U.S. and Canada use e-mail daily. From the end of 1991 to the end of 1993 the number of users grew 17 percent each year. The typical e-mail user sends 1 to 5 messages per day.



Source: Electronic Messaging Association



Source: Dataquest Inc.

cussed working together to provide the connection from the user to the network. Meanwhile, companies like Oracle Corp. are already showing multimedia servers capable of delivering text, graphics, audio, and video virtually anywhere, by means of a massively parallel computer connected to a fast nationwide network.

How quickly this will come to pass is also a matter of much debate. After all, public on-line services have been around for several years, but only a relatively small number of people use them for their personal communications, compared with the number who use the telephone or regular mail.

Similarly, videotext experiments, video-on-demand, and electronic banking from home have all been tried with less-than-stellar results. One thing seems to be clear: Nationwide computer networks will impact business long before they enter every home.

Already more than 50 percent of office workers in the United States use computers, and nearly half of the PCs in the U.S. are now connected to networks (see the accompanying charts). All sorts of information is now available through

corporate networks. It ranges from simple e-mail to schedule management, and on to more complex procedures such as management of transaction data and information handling. Some workers even have access to things like news feeds or electronic documents shipped over the network.

In the long term, we may very well have public and private information utilities giving office workers access to all of the information they need to do their jobs.

GROUPWARE BY ANY OTHER NAME

Within organizations, perhaps the most important trend is the push for software that really is designed to help people work together. We've already introduced you

to the concept of software called *groupware*. But that name is really an oversimplification. What we actually are seeing is a variety of programs being designed to work over a network, and to let people work together over a network.

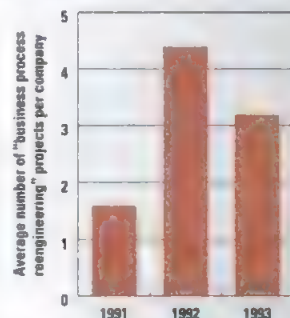
Some of these are simply traditional word processors, spreadsheets, and graphics programs that have been augmented with workgroup features. For example, all spreadsheets now have features that let multiple

people update particular ranges over a network. Notable in this group is the Version Manager feature of Lotus 1-2-3, which tracks the who, when, and why of changes in a spreadsheet. Similarly, desktop publishing packages are being designed for multiple users. Even graphics programs such as Harvard Graphics let multiple people share a common screen.

Perhaps more important are products designed to automate the way people work in an office environment. E-mail has been around for more than 15 years, having started with mainframe systems such as IBM's PROFS. But in the past 5 years, PC-based networking has really taken off, with the number of users in the U.S. grow-

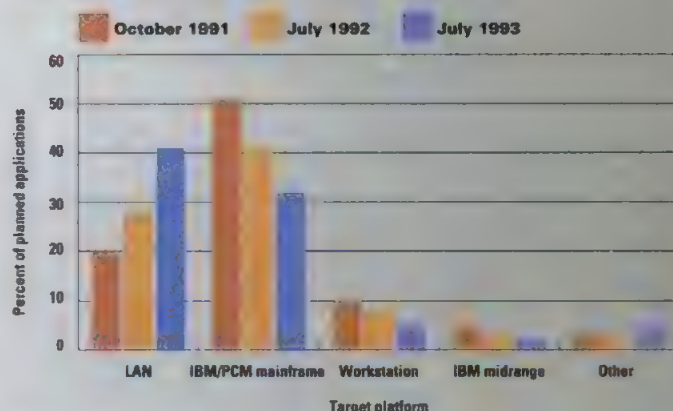
... as Companies Change the Way They Work

Process reengineering is still a high priority at the 400 companies that responded to Deloitte & Touche's 1994 sixth annual survey of North American CIOs.



Source: Deloitte & Touche

In addition, LANs were the target platform for 41 percent of the new applications at 9,000 surveyed mainframe sites by July 1993.



Source: Computer Intelligence InfoCorp

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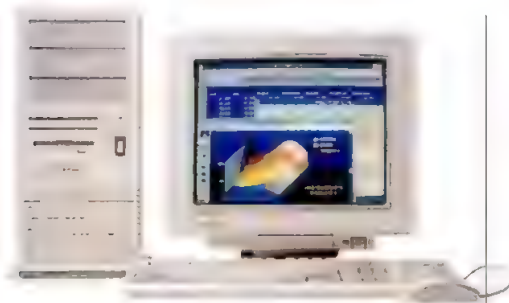
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♦
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♦
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♦
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with cordless, intelligent pen
♦
Local Bus Video
♦
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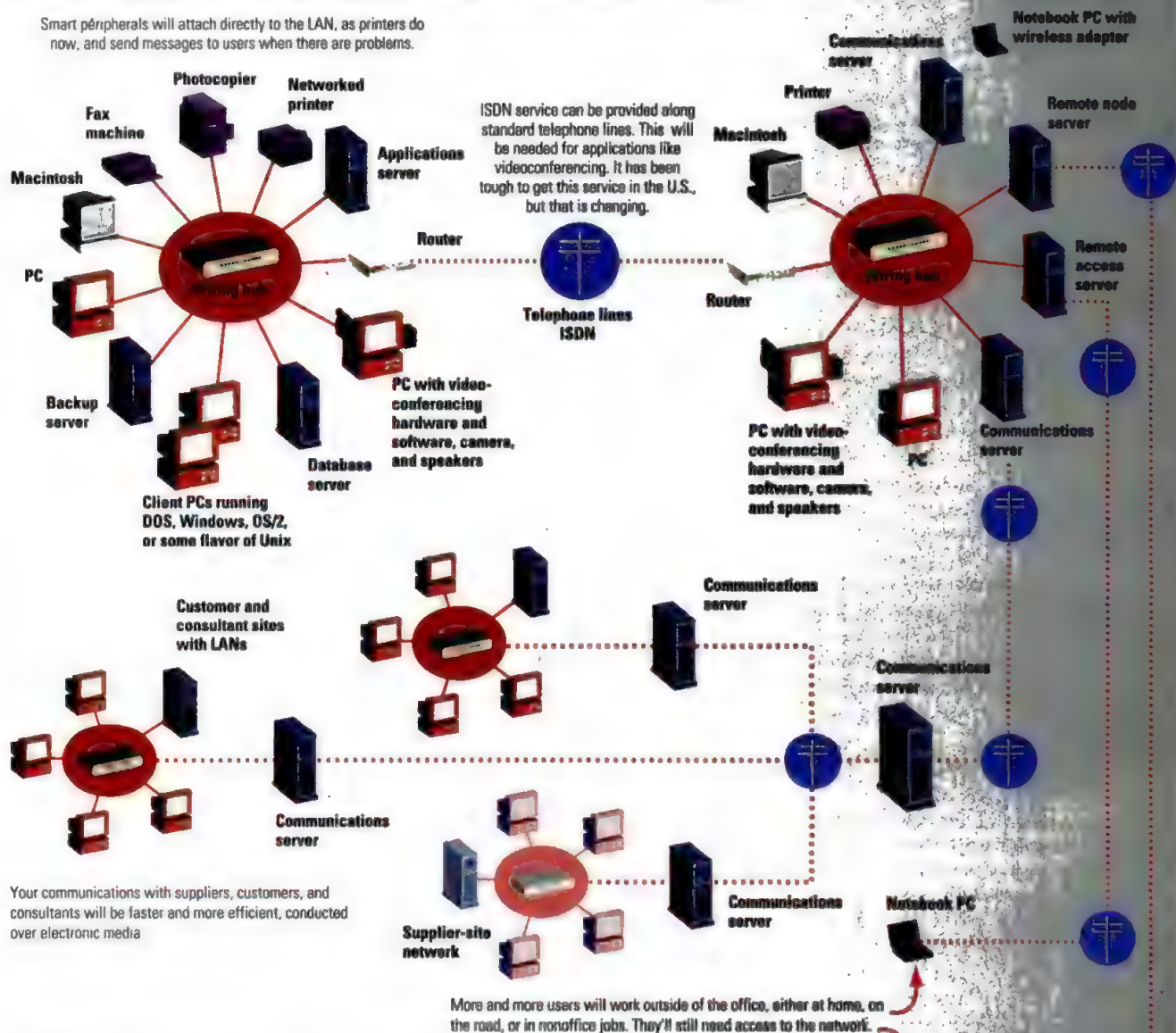
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ing from 6 million in 1987 to about 40 million by the end of 1994. This has been augmented by new methods for connecting dissimilar mail systems, such as X.400 addressing standards, direct gateways, and connections via the Internet. All of this has led to more and more connections between disparate LANs.

Other software trends make it likely that e-mail use will develop even further. New standards, such as Microsoft's Mail API (MAPI) and Vendor Independent Mail (VIM), which is endorsed by Lotus and others, enable applications to be more tightly integrated with e-mail. This lets you do things like send mail while you're still in your word processor. Taking this one step further, Microsoft is now integrating messaging features into its new operating systems.

We're also seeing new group scheduling features, both in standalone applications that are designed to work over networks and as add-ons to popular e-mail features. Beyond simple communications, we're seeing products designed to facilitate such things as routing information within an organization—but they involve a vast array of different kind of programs, designed to solve multiple tasks. (See "Go with the Flow.")

The one exception to highly segmented categories of groupware may be Lotus Notes, clearly the star of the entire groupware category. Notes combines traditional e-mail features with a forms designer and applications-development tools all built around a distributed, replicated database. On its own, it may not handle each of the individual applications as well as some more targeted applications, but it's unique in the scope of applications it tries to address.

REENGINEERING THE OFFICE

One big argument, of course, is that all of this changes the traditional command-and-control methods of management. Information is now distributed and available to a much larger group of people. Because information is no longer concentrated in the hands of a few managers, the basic jobs of managers and subordinates will have to change. This is coming to be called *reengineering*.

This, in turn, leads to changes in the basic ways that companies work. For

Buzzword Watch: A Glossary for the Changing Office

ATM Asynchronous transfer mode; a high-speed data communications standard. It uses fixed-length packets and facilitates transmission at up to 155 megabits per second. Also known as *cell relay*.

bridge A device that links two networks using similar or different protocols. The bridge only senses whether a packet belongs on the local network or should be sent across the wire; it cannot *route* the packet. (See also **router**.)

client/server In networking, refers to a network in which several PC-type systems (clients) are connected to one or more powerful, central computers (servers). The servers act as central storehouses, serving files, information, and applications as requested by clients. In databases, *client/server* refers to a model in which a client system runs a database application (front end) that accesses information in a database management system situated on a server (back end).

CDPD Cellular Digital Packet Data; a standard for data communications that uses the unused signal in the bandwidth currently reserved for cellular voice transmissions. Many cellular providers have begun to implement CDPD, because it allows increased traffic—and revenue—on existing facilities.

encryption The use of algorithms to encode data in order to render a message or other file readable only by the intended recipient.

FDDI Fiber Distributed Data Interface; a standard for use of fiber-optic cable in a PC-based network running at 100 Mbps.

forms routing The process in which a form is electronically created, filled out, and routed through an organization for additions, corrections, and approval, without a paper copy being created.

global directory services A universal naming scheme for all of the resources on a network that makes it easier for users to access resources and for administrators to manage the network. Novell's NetWare 4.0 and Banyan's VINES both have global directory services.

groupware An evolving class of software designed to function over a network and optimized to allow several people to work together on documents and files. Also called *workgroup software*.

hub A central wiring device that repeats or regenerates data signals sent over the network; also called a *repeater*. More sophisticated hubs can provide bridging, routing, communications, and internetworking functions.

Information Superhighway The popular name for the concept that every home and business will be connected electronically over a huge network made up of links to a wide variety of information sources, including commercial, governmental, and research-oriented sites. Telephone and long-distance companies, cable-television providers, and public utilities are vying to provide connections.

Internet A worldwide network of computers and computer networks at private organizations, government institutions, and universities, over which people share files, send electronic messages, and have access to huge amounts of information. With the Internet gaining popularity with a broader group of users, interfaces to its massive resources will improve greatly.

ISDN Integrated Services Digital Network; a standard for an all-digital communications network that can carry data, video, and voice. Because of their high speed and relatively low cost, ISDN lines are expected eventually to replace standard telephone lines as the primary carrier of business data.

example, using the computer as a communications device, companies can now more easily put together temporary teams of people to solve particular problems.

A team could be a group of people with a common business interest or a need to work together. Participants could be located at the same site or at several different sites. And they could work for the same company or for different compa-

nies. Such teams can be assembled and disassembled at will. New technologies, such as the *virtual network* capabilities of upcoming LAN technologies, should make this even easier. (Under a virtual network, network administrators will be able to dynamically configure and reconfigure structured groups of users both within and outside traditional corporate boundaries.)

modem Modulator/demodulator, a peripheral that converts the digital language of the PC to a series of high- and low-pitched tones for transmission over standard (analog) telephone lines

packet A block of data that goes over the network. It contains the data itself plus identification information for the sending and receiving stations

paperless office A concept—as yet unfulfilled—of an office in which electronic mail, forms, and documents replace cumbersome paper as the means for communications and record-keeping

portable document format A file standard for documents—such as memos, forms, and letters—that can be viewed and printed by any properly equipped computer, regardless of the application that originally produced them

reengineering Instituting an overall change in the way companies are structured and run. The principal idea is that information that once was in the hands of the few who ran things is now distributed among the many, far more people are empowered with decision-making information and responsibility

retooling The moving of mainframe-based applications to a PC-based network. Some of the key issues are maintaining data integrity and reliability, capacity, and security while providing greater accessibility and lowering costs

remote access Connecting to a network via modem over telephone lines from a remote location—usually from a home or while traveling. Two types are used. Under *remote control*, the remote PC acts as a dumb terminal to operate a computer that is a node on the distant network. Under *remote node*, the remote PC is actually connected as a node on the network and can directly access network resources

router A network device that links two or more usually geographically separated LANs and forwards

to each LAN only those messages intended for that network. This balances traffic and improves performance. More sophisticated routers can link LANs based on different protocols

rules-based system A software system in which the program makes decisions based on a set of user-defined rules similar to those that a human expert would use. When presented with a situation, the software uses those rules along with a knowledge base to diagnose a problem or perform an appropriate action. Also known as an *expert system*, sometimes loosely termed *artificial intelligence*

smart peripheral A catchall term for any peripheral device, such as a printer, copier, or fax machine, that has intelligence built in so that it can be attached directly to the network and communicate problems to users and LAN managers.

telephony The conversion of sound into electronic signals for transmission to another location. *Digital telephony* refers specifically to converting sounds to digital format for storage or transmission over computer networks

V 32bis The ITU (International Telecommunications Union) standard for 14.4-Kbps modem communications

V 34 The ITU draft standard for 28.8-Kbps modem communications. Approval is expected later this year

wireless communications One- or two-way data transmissions, without wires, by means of radio-frequency, cellular, or infrared technology. These methods can be used for networking but are very slow compared with hard wiring, and their uses currently are limited

workgroup A group of users or computers connected over a local area network and set up to share information and resources such as printers, software, and disk space. A larger LAN can be divided into several workgroups to make management and resource allocation simpler

As part of the reengineering process, many companies are going through what some consultants call *retooling*. This is the process of moving old applications to or creating new applications on PC-based networks. In these situations, often a few large servers on a PC network take the place of mainframe. In fact, Computer Intelligence InfoCorp reports that at sites that use mainframes, more new corporate

applications are now being developed for PC networks than for mainframes (see the accompanying chart).

All of this has in turn placed increasing attention on PC-based applications development. For transaction-based information, many firms have developed systems using client/server databases, accessing data through traditional PC databases such as Paradox or Access, or through

dedicated front-end tools such as PowerBuilder.

Some companies have used network accounting packages or created executive information systems (EISs) to track the changes in their businesses. Others are using groupware such as Lotus Notes as

All of this is leading the push for better and faster network operating systems and networked applications, and more intelligent network management software.

applications-development platforms.

Today, security and reliability are still major issues in moving such projects from mainframes to networks. As these issues are being resolved, we see such network-based applications becoming much more common in both small and large organizations. All of this is leading the push for better and faster networks, more sophisticated network operating systems and networked applications, and more intelligent network management software.

NEW TECHNOLOGIES

Although many of the basic building blocks for the office of the future are here, a lot more of the details still need to be worked out.

For example, we've all been hearing about the paperless office for years, but that is still years away—if, indeed, it ever arrives (see "The Less-Paper Office" later in this article). We are, however, seeing some steps in that direction. CD-ROMs and on-line services are providing a lot of information electronically that used to be available only on paper. New electronic document-publishing software, such as Adobe Acrobat, makes it easier to transfer documents over a network.

At the same time, we're seeing more devices being planned to hook into computer networks. Microsoft at Work (MAW), for example, is a method of tying such things as fax machines and printers

into networks. Similarly, there has been a lot of work to connect telephone systems and PC networks, through things such as Microsoft's Telephony API (TAPI) and Novell and AT&T's telephony alliance. (These areas are discussed in "Peripherals Get Smart" and "Calls from the Keyboard" in this article.)

We're also seeing initiatives to tie together wireless information-distribution networks and cellular telephones, and make all of this available from a notebook computer, personal digital assistant, or other hand-held device.

All of this will change the nature of

work itself for millions of people. Your PC—which may well be used as much for communications as for computing—will be able to get and send messages for you whenever you want, wherever you are.

No one is sure exactly what the office of the future will look like, but we know it will be very different from what we're familiar with now. We know that networks and new kinds of software designed to make communications easier will play a large role.

The basics of this change are available now: Just plug in, dial up, and log on!

Peripherals Get Smart

Some pieces are in place for seamless management of peripherals.

Pop open a Window on your screen. You see that you've received the new logo artwork via fax (as a binary graphics file—not a fax image). You link it to your report document, which you send to the high-speed photocopier down the hall to create 20 collated, stapled copies, in time for the meeting that's about to start. At the same time you send electronic copies to a list of managers at local and distant sites, by e-mail or fax as appropriate.

Clearly such a vision requires some distributed intelligence among peripheral devices—something we're just beginning to see. Microsoft At Work, for example, is a concept that would put a standard intelligent interface on everything from fax machines and copiers to telephones and hand-held PDAs. You need to have fax machines and copier/printers, as well as e-mail message servers and client PCs all cooperating to accomplish these tasks seamlessly. As dreamlike as this vision sounds, some of the pieces required are already on hand.

Intelligent peripherals are not new.

The first desktop laser printers had faster processors and more memory than the computers to which they were connected. The problem was that, in spite of their intelligence, they couldn't talk back to let the user know about paper jams or low toner. Today, with products such as Hewlett-Packard's JetAdmin and Jet-Print, users and network managers can monitor and even reconfigure printers from their workstations.

Fax-server software for networks is making it possible for a shared fax modem to receive incoming faxes, and automatically notify the recipient using LAN e-mail services. Even telephones are getting into the act.

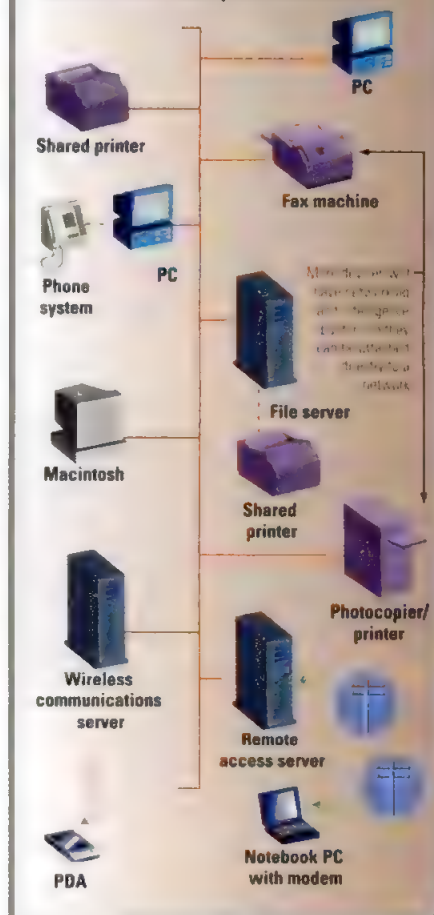
Smarter devices are made possible by a number of advances. Faster CPUs in PCs and servers mean more power for handling peripheral-management tasks. The

drop of system prices make it affordable to create dedicated servers for some tasks, while miniaturization allows manufacturers to build server and network interface functions right into their devices.

So what's wrong with this picture? The

Direct Connect

In a smart office, computers and printers won't be the only things attached to the network. Copiers, fax machines, and telephones will all have built-in networking capabilities, and will be controlled by users running software from desktop and notebook PCs.



problem is that manufacturers have developed their own approaches to providing these features. The next move will be to create standard interfaces.

HP, Intel, Lexmark, and Microsoft (among others) have helped develop a proposed IEEE standard called P1284, also known as the Extended Capabilities Port. This design can speed printer performance and enable the printer to send messages back to the PC.

At the network level, bidirectional communications can be handled fairly easily by the network-management interface. But, then, how should peripherals and client PCs converse? One approach is to use the Simple Network Management Protocol (SNMP) to control the exchange of messages, and to define Message Infor-

Smart devices are made possible by a number of advances. Faster CPUs in PCs and servers mean more power for handling peripheral management.

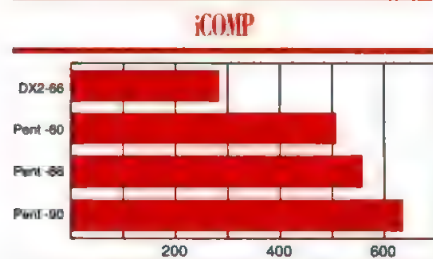
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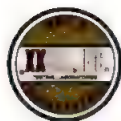
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- PCMCIA 2.4/9.6 kbps data/fax modem • Extra battery, battery charger • Carrying case

SN Quick Dock:

- Port replicator • 14" SVGA color monitor • Full-size keyboard

N Instant Office:

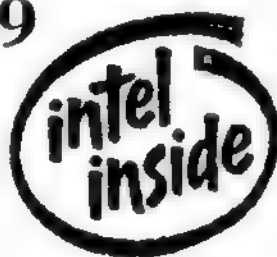
- Docking station • 15" FST-NI color monitor • Full-size keyboard

N Traveler:

- PCMCIA 2.4/9.6 kbps data/fax modem • Extra battery

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Overview

mation Bases (MIBs) for different classes of products.

A standard MIB for printers might include alerts to operators, configuration settings, or inquiries for emulation mode, and identifiers that allow a user to specify what type of printer is at the other end.

With At Work, Microsoft plans to

standardize not just communications between shared peripherals, but the user interface itself. Early At Work products exhibit impressive integration.

So, although many pieces are in place, we still have a ways to go before we can take full advantage of the smarts showing up in peripherals. —Alfred Poor

The Less-Paper Office

Electronic documents may yet give paper a run.

Here's the simple truth. The *paperless office* is not just an unrealized goal; it is unrealistic. The paper document remains an indispensable medium, because it is relatively inexpensive to produce, requires no special equipment to be read, takes advantage of established conventions regarding data structure and formatting, and can communicate a wide variety of information. Nevertheless, a confluence of technological advancements has made high-quality electronic documents a viable alternative to paper.

There are important distinctions between classes of electronic documents.

One class, produced by programs such as Adobe Acrobat (modules from \$195 to \$2,945, 800-272-3623), Common Ground, from No Hands Software (\$189, 800-598-3821), Farallon Replica (\$99, 510-814-5000), and the upcoming WordPerfect Envoy (\$189, 801-225-5000) take their cues from paper publications.

All four install as virtual printers under Windows. Creating an electronic document is as simple as generating paper output: You simply issue a print command. Because each program can handle only its own file format, though, it is important to consider how widely, how easily, and how cheaply reader utilities can be distributed. All four programs offer both Windows

and Macintosh versions.

If you give up the paper document paradigm, a whole new class of electronic documents opens up to you. Programs here pay less attention to the formatting of a document and stress on-screen consumption and manipulation of information.

The best known example of this document type is the Windows Help facility. The Help viewer is built into the operating environment and is therefore always available to publisher and reader alike.

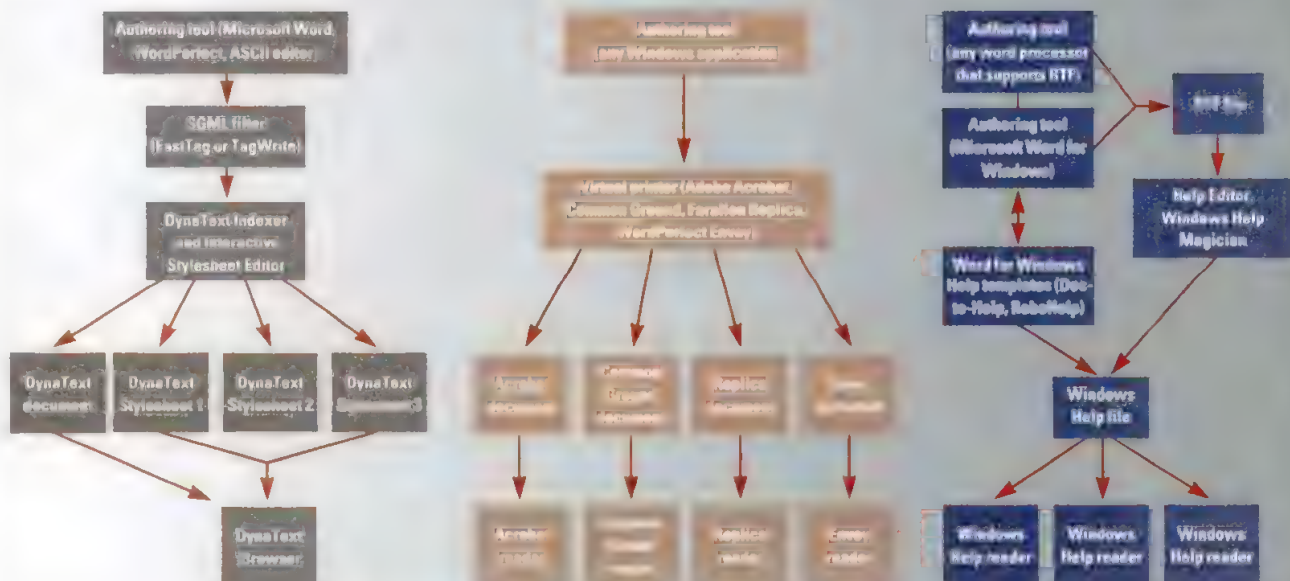
And, thanks to third-party authoring tools, such as WexTech System's Doc-to-Help (\$295, 212-949-9595), Blue Sky Software's RoboHelp (\$499, 619-459-6365), and Software Interphase's Windows Help Magician (\$199, 800-542-2742), even non-programmers can take advantage of the Windows Help engine by converting standard Rich Text Format (.RTF) documents to hypertext versions.

SGML (FINALLY?)

The ultimate electronic document format may prove to be SGML (Standard Generalized Markup Language). Developed for mission-critical publishing systems (such as those for aerospace and government agencies), SGML provides a set of rules for describing the structure of a document. Other than the identifying header

Getting There from Here

Each of three methods for processing electronic documents delivers its own formatting and feature set, and each requires different "reader" software (bottom row). In the method shown on the right, the user's system only needs to be running Windows, but document-formatting flexibility is limited.



and structural description, an SGML file contains only ASCII text and pointers to external graphics files.

Several programs convert popular word processing or desktop publishing formats into SGML. A few are Avalanche Development's FastTag (for DOS/Windows, \$2,700; 303-449-5032) and Zandar's TagWrite (\$1,700, 802-365-9393). Currently only DynaText, from Electronic Books Technologies (\$5,000 to \$150,000, 401-421-9550), provides an Indexer, an Interactive Stylesheet Editor, and a

Browser based on the SGML file format.

Merely replicating the convenience and portability of paper documents will not guarantee the success of electronic equivalents. So expect to see capabilities that go beyond simple text searches and hyperlinks. Electronic documents will increasingly be integrated with work-group, e-mail, and archival systems. Perhaps the most important way in which electronic documents compete with paper publications is in their ability to handle diverse data types. —Luisa Simone

other networked devices. The telephone stays on the desk, but you can control it from your keyboard. Microsoft's integration is tighter, but Novell's structure makes it less daunting to install and to develop applications for the PC and PBX.

Dialogic's Signal Computing System Architecture (SCSA) adds smart voice capabilities to both the LAN and the PBX. SCSA is a specification for hardware that talks and listens so you can use software such as Vista, from ZyBel Microsystems, to build interoperable speech recognition and voice-synthesis applications. SCSA is compatible with At Work and TAPI, but developers will initially work under Novell's NTSA because it has a bigger market. Many SCSA voice hardware products are designed to slide into a NetWare server.

Outside of the PC and the LAN, the major technology enabling the integration of desktop information is (finally) the introduction of digital telephone service

Calls from the Keyboard

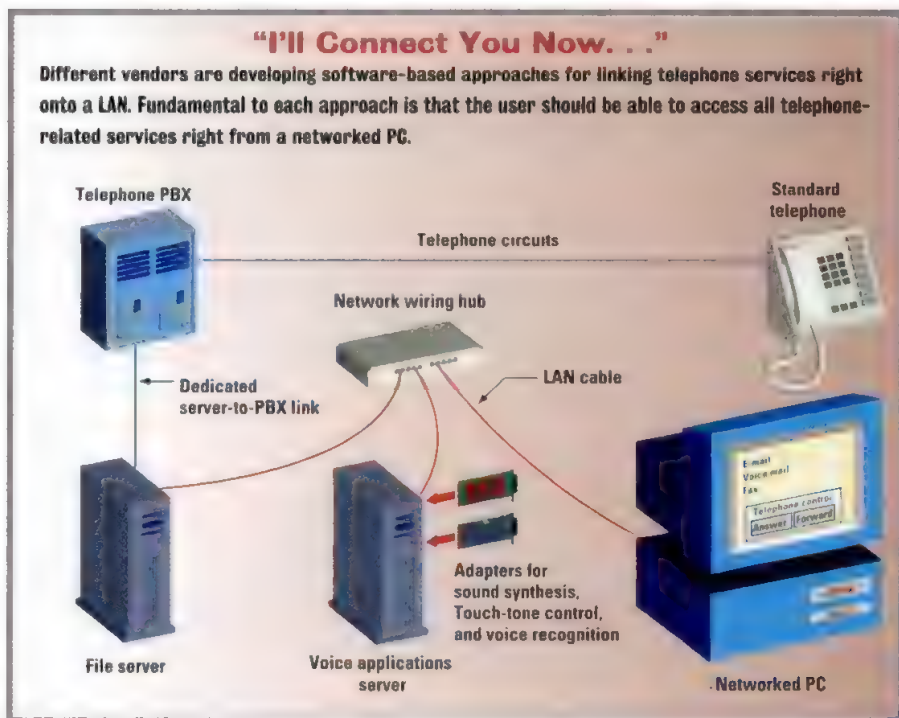
The telephone is just another peripheral in a changing office.

In today's office, your PC should be the place where you can do everything you need to do. You should be able to handle your documents and data, your links to outside information services, e-mail, videoconferences, fax—and your telephone calls and voice mail—from the keyboard and screen. This doesn't mean that the software for all those functions has to run on the PC, only that you can get at what you need to through consistent and integrated interfaces.

The bridges that link the elements in this new office are under construction. The network infrastructure acts like the towers and cables holding it all up, but there's much more. Services like ISDN (Integrated Services Data Network) and ATM (Asynchronous Transfer Mode) are laying digital paths to the office. Companies like Microsoft, Novell, and Dialogic Corp. are designing the architecture for the bridges. Other companies that manufacture private branch exchange (PBX) telephone systems, printers, copiers, and fax systems are turning out the planks.

On the telephone side, the PBX will remain in its own cabinet, but it will have new capabilities. Unfortunately, though, Microsoft and Novell each have a different idea about how a PBX will link to a LAN. Microsoft wants PBXs to be part of Microsoft At Work. Microsoft's aim is to integrate the desktop telephone with the PC. But some PBX vendors, protecting their reputations for high reliability, are skepti-

cal about loading multiple software functions into telephone switches. Microsoft also has a series of specifications called Telephony API (TAPI) describing how



devices and programs on individual PCs interact with the PBX.

Novell's NetWare Telephony Services Architecture (NTSA) defines a physical link between a network server and the PBX. It's an arm's length relationship that is more comfortable to PBX vendors. Applications running in each PC interact with the PBX as they do with printers or

under the ISDN architecture. ISDN brings in data at 128 Kbps. It includes many features, such as dial-up connections that take only milliseconds to establish.

ISDN makes videoconferencing, database replication, and document transfer practical. But high software costs for the local telephone companies have slowed ISDN's growth. According to BellCore,

“If I Only Had A Gateway!”



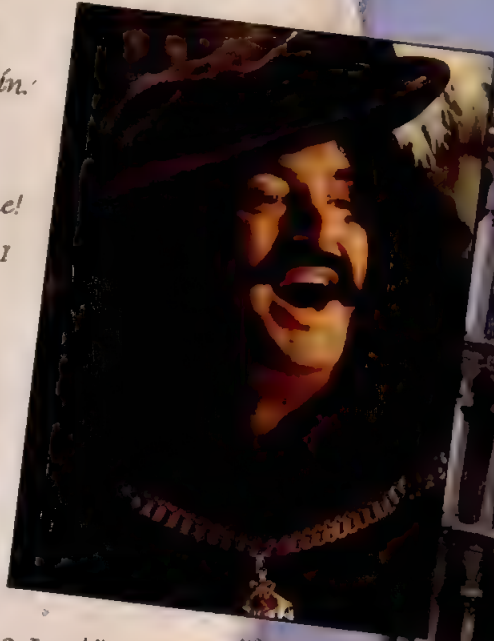
There I was, eating Mama's
spaghettí, when Guido and the boys
come over, Yo
Bonanno! Your
tower, it's a leanín.

Mama-mía!
What's a matta me!
That's a last time I
buy a kit from the
Towers-R-Us
catalog. Never get
enough cement
míx. So, I used my
mother-in-law's
línguine sauce as
extra cement. Oh boy, I no like how
that turned out. And that's a last
time I tell the workers we eat only
after the foundation is laíd!

I guess they tried to tell me
the soil was bad. I thought
they said the 'royal' was
bad. And they were right
- that kíng Antonio waza
pretty nasty.

If I had a Gateway P5-90, I coulda
designed my own tower. And it
woul'da been magnífico! The best
tower the world ever saw.

Looka me. I coulda done so much
better. It's a too late for me and my
tower. Don't you be offa plumb,
and be sayíng like me, 'Gee, I wish
I woul'da had a Gateway.'



"Gateway's Pentium Architecture Would've Set Me Straight"

...Bonanno Pisano, engineer, 1174

"If I only had a Gateway!" — the anguished, rueful cry of a non-Gateway user. The lesson: Don't leave the success of *your* landmark projects to an archaic system. Get a Gateway 2000® PC and you'll have the latest technology in a high-quality PC, built to stand the tests of time. You get straightforward service and support from Gateway's knowledgeable employees. And best of all ... no regrets coming back to haunt you!

Gateway's Superstructures

Look at it from this angle. You just gotta have the most powerful PC architecture available today, right? But there's no way you want to pay skyscraper prices, true? Your solution? Gateway 2000's P5 systems! These Pentium™-based machines are designed to give you all-around monumental performance — they're some of the fastest PCs you can find today! Capice?

Based on Intel®'s Pentium processor, all P5 models include a PCI local bus and an enhanced PCI/IDE controller allowing your hard drive to transfer data *up to twice as fast* as non-enhanced IDE systems. Gateway's P5-60 and P5-66 models, and our three power-packed **90MHz** models (*starting at just \$2,995*), give you a value that towers over the competition!

Gateway's P5-90 machines use Intel's super 90MHz processor for foundation-shaking power. You get a rare combination of colossal power and performance, *and* a great price. Ah, magnifico! Just look at these features: performance-boosting 540MB hard drives, 8MB or 16MB RAM, double-speed CD-ROMs, high-end graphics controllers and your choice of application software. Two 90MHz systems also include 16-bit sound cards and Yamaha speakers. Go ahead and compare. You'll see that these value-packed PCs stand unmatched.

Get all the tools to create lasting impressions with any Gateway P5 system. Mama mia — starting from only \$2,495, our Pentium values are out of this world!

Classic Attractions

Our 486 PCI machines are Gateway 2000 classics built on a solid foundation of performance and value. Our new **100MHz DX4** machine, priced at \$2,495, is based on the fastest 486 processor available! With the same PCI local bus as in our P5 line, all 486 PCs will give you a great power boost. They include 8MB RAM, 540MB hard drive and a double-speed CD-ROM drive. These 33MHz, 66MHz and 100MHz systems are all upgradable to Pentium technology so you can expand in the future.

Portable Sidekick Special Offer!

A perfect sidekick for your Gateway desktop system is the HandBook® 486 portable PC. It's just like having an extension to your desktop system! Call about our special desktop/HandBook combo today, available only at the time of desktop purchase. Having all the information you rely on, everywhere you go, has never been so easy.

Gateway's P5-90 and P5-90 Tower systems rise above the competition!



8 0 0 - 8 4 6 - 2 0 6 3

"A Gateway Portable



Heading out on another worldly expedition? Whether it's transcontinental or transatlantic, a Gateway portable PC puts you at the controls, steers you in the right direction and sends you flying!



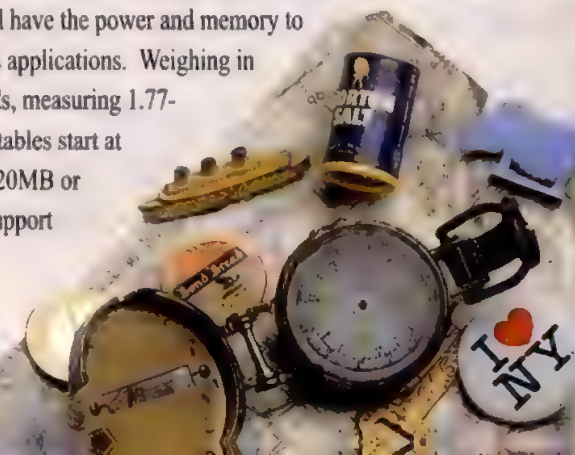
GATEWAY2000
COLORBOOK™

Flying Machines

How can you go wrong? You can't! A Gateway 2000® ColorBook is just what you need for high-in-the-sky performance.

A portable PC with the supersonic performance of a desktop is yours with the power-packed **DX4-75MHz** ColorBook. With a 75MHz processor, you'll never want to leave the ground without it. And look, over there! No, your eyes aren't deceiving you — that's a **10.3-inch, dual-scan screen**, now on *three* ColorBook models. You won't find a screen this big, this affordable, anywhere else. It blows the competition out of the water!

All ColorBook models are based on the Intel® SL Enhanced 486 DX2 or DX4 processor and have the power and memory to run all your Windows applications. Weighing in at less than 5.7 pounds, measuring 1.77-inches thin, these portables start at \$1,995 and include 120MB or 250MB hard drive, support for simultaneous video, built-in trackball,



Do you know the way to San Jose?
New York 1988. I needed my
\$9000 airplane for the flight to
California. Everyone has a hobby.
right? Little did I know my obsession
with refrigeration magnets would bring
a dark cloud of humility down upon me.
I placed my collection of magnets all
around me. Mr. Piggy on the Throttle,
The Motion Sickness by the atomizer
and my favorite, The Titanic, right by
the compass — hundreds of magnets
all over the cramped cockpit.
As I took off into the wild blue
yonder, did I hear someone say, they,
Douglas, you're going the wrong way!
No, they must've said, 'Have a nice day.'
It'd been giving me a headache when I looked
down and thought — I know they're called
The Great Lakes, but this is ridiculous!
Is this compass right? I whacked it
a few times, some of my dashboard
magnets fell on the floor.
My compass wasn't crazy
until I put them back in
place. Go figure. I
continued on my way. What
was that? A whale in
Lake Superior?
Land greeted me after
27 hours. Where's the
sun, the beaches? I only
see redheads and lucky
Chambers?
Damn those refrigeration
magnets! Boy was the wife steamed.
Hello, honey? Um... I'll be a little late
for dinner. I wish I would've had a
Gateway portable to keep me on course.

Would've Steered Me The Right Way?"



two PCMCIA Type II or one Type III slots, 256 colors running in VGA mode, excellent battery life, and a great suspend/resume feature.

You'll know you're headed in the right direction for top-flight performance when you get a Gateway ColorBook.

4 GATEWAY2000 **H A N D B O O K[®] 486**

Take Flight!

It's so lightweight, you'll soar! So powerful, you'll be in awe! That's the HandBook 486 from Gateway 2000. Take flight with this compact little PC no matter where you go. Taking the world by storm with a footprint of just 9.75 inches by 5.9 inches, the HandBook 486 weighs in at (*are you sitting down?*) under three pounds! That's lighter than any Intel 486-based portable available today.

Still up in the air about the combination of portability and power? Head this way, because the HandBook 486 is a real PC and the only DX2 subnotebook found on any continent. No compromises here.

You'll get an IDE hard drive with up to 130MB, standard 4MB or 8MB RAM upgradable to 20MB,

a backlit VGA screen, 78-key keyboard, EZ Point™ integrated pointer, and that terrific suspend/resume feature.

Whether you're a world traveler or an urban commuter, the Gateway 2000 ColorBook and HandBook offer you all the perks you deserve. So don't pick up the phone and go the "wrong way." Call Gateway 2000 straight-away!



8 0 0 - 8 4 6 - 2 0 6 3

Ever have one of those days? I was eating my Eggs Benedict when the wife looked up and snarled, 'You're not going to hang out with those friends of yours today, are you?' What did she mean by that? These were guys in togas, they didn't have much to hide.

But even the oracle told me not to go to work, 'You shall regret the company you keep.' What did that mean? After years of running

amuck, conquering empires, and going on Roman holidays together, I felt I knew these guys.

After making a stop at the V and X cent store for eucalyptus lip balm, I continued on to the Senate house. Second mistake of the day. The first was getting out of bed.

Even as my last breath passed my lips, I wondered, 'WHY?' Death at the hands of my closest friends, then a salad and one of the hottest months of the year named after me. Hardly a fitting end for a man of my stature. Just goes to show no matter how much time you spend with guys in togas, you never really know them.

Man, I wish I would've had friends in the business.



"If I Only"



Sometimes it's hard to know who to trust, especially in the competitive PC arena. You'll find our honest, hard-working employees to be allies, supporting villages and empires alike—wherever Gateway 2000® computers are found. Our loyal customers have helped us to become a Fortune 500 company, but we're not resting on these laurels. Every Gateway 2000 employee is committed to our philosophy of providing customers with a quality product at an unbeatable value, along with the best service in the land. You have our word on it.

Service Allies

As a Gateway 2000 customer, you receive toll-free technical support for the life of your system. And with the purchase of a Gateway modem you'll get Triton's CoSession™ Host at no additional charge. CoSession Host, a remote diagnostic software,

History-Making Extras!

Call the Gateway 2000® special component add-ons division at 800-846-2080 for our complete line of extras for Gateway customers. You'll get an unmistakable value on peripherals listed below, sold only with the purchase of a system.

Multimedia

Multimedia Kit

Here's everything you need to add multimedia to a Gateway PC that has a CD-ROM drive:

- Gateway 2000 16-bit CD-quality sound card, compatible with Sound Blaster™ cards, with MIDI/game port, mic in, stereo line in/out
- 2 Labtec® CS-180 speakers
- Microsoft® Encarta Multimedia Encyclopedia
- Corel Professional Photos CD Sampler

\$132 (with system purchase)

Get the multimedia kit with a CD-ROM for **\$299** (with system purchase).

Yamaha® YST-M10 Multimedia Speakers

The small speakers that sound big and come with a tiny price! This free-standing, self-powered speaker set is a great value. **\$75**

Altec Lansing ACS-300 Multimedia Speakers

Get superior stereo sound with these top-rated Altec Lansing ACS-300 speakers with separate powered subwoofer. **\$219**

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TelePath™ II Fax/Modem

Internal fax/modem, 14,400bps modem, V.32bis, with 14,400bps fax capability. Package includes data and fax communication software, CoSession™ Host remote diagnostics, plus a CompuServe® trial membership. **\$129**

Colorado Memory Systems® TBU

250MB internal automatic tape backup unit copies up to 9.5MB per minute. Comes with MS Windows™ and DOS® software, one tape and cable. **\$149**

Networking

Intel EtherExpress™

A 16-bit Ethernet adapter from a world leader in networking.

\$105 Twisted Pair or BNC

Ethernet Adapter from 3Com®

Manufactured by 3Com for Gateway.

\$105 Twisted Pair **\$125** BNC

Token Ring

IBM® 16-bit ISA Token Ring card. **\$429**

Monitors

CrystalScan® 17-Inch Monitor

Non-interlaced color monitor with intelligent multiscanning analog color display capable of ultra-high resolution up to 1280 x 1024 in non-interlaced mode and .26mm dot pitch.

Upgrade from a 14-inch monitor **\$395**

Upgrade from a 15-inch monitor **\$335**

(Prices good only for upgrades at the time of system purchase.)

Printers

HP® DeskJet 520 Inkjet Printer

Get a great price on HP's inkjet printer with 600 x 300 dpi; sharp, professional-quality documents; six built-in typefaces and 14 TrueType scalable fonts for Windows. **\$299**

HP DeskJet 560C Inkjet Printer

Affordable black-and-color printing. You get advanced color printing with built-in ColorSmart technology. 600 x 300 dpi and six built-in typefaces. **\$599**

Epson ActionLaser 1500 Laser Printer

The ActionLaser delivers professional-quality printouts. Fast six-page per minute speed, 14 resident fonts, 300 x 300dpi, and 1MB memory expandable to 5MB. Parallel cable included.

\$669



"You've got a friend in the business."®

Overview

though, many local telephone companies will have 80 to 90 percent of their lines ready for ISDN by 1995.

Integration of the devices on the desktop, particularly the telephone and PC, is

at hand. The more you share resources, the more you reduce costs and increase productivity. Integration across the desktop is more than welcome.

—Frank J. Derfler, Jr.

Powerful Convergence

One view holds that the PC is central to the picture.

Some people call it the information highway, but that slick metaphor quickly falls apart. It's more useful to think of the coming changes in how we interact as the *convergence* of powerful processing, improved bandwidth, massive storage, and a social need to communicate.

What is the actual benefit of this convergence? Companies are betting that people will want interactive sports, movies on request, work at home, and endless access to caches of information. Each participant's view of convergence depends on its starting point.

Companies with a television orienta-

tion see everything as TV. Kaleida Labs, Motorola, and Scientific Atlanta are developing a product called the Malibu Graphics Controller for TV-top systems that will be your convergence buffer. Scientific Atlanta and Silicon Graphics are working with cable-TV giant Time Warner to deliver video-on-demand.

PG-CENTRIC

One view is that only the PC has the power, flexibility, and central focus needed to bring together the total picture. The PC already acts as a smart terminal for information services, a place to transmit and receive faxes, the portal to e-mail, and the creation station for all business documents.

The average PC has a ways to go before it is the perfect gateway to conver-

Constructing the Infamous Superhighway

Telephone, cable, utility, and on-line service companies are testing a variety of ways to bring interactive information services to your home.

Seattle, Wash.

Tele-Communications Inc. (TCI): Trial of interactive services in partnership with Microsoft Corp.

Portland, Oreg.

US West: VOD trial. **Bell Atlantic Corp. and TCI:** Network upgrade to hybrid fiber/coaxial architecture.

Milpitas and San Francisco, Calif.

Pacific Telesis Group: VOD and interactive services to 1,000 subscribers via hybrid fiber/coaxial network. **InterMedia Partners:** Interactive services trial with partners IBM Corp., ICTV, and Zenith Electronics Corp. **Pacific Bell:** VOD trial to 1,600 subscribers in partnership with AT&T and Hewlett Packard Co.

Sacramento, Calif.

The Interactive Network (interactive game shows and sports events): Trial open to 3,000 subscribers in partnership with A.C. Nielsen Co., Columbia Pictures Corp., Chrysler Corp., General Electric, Sony, and TCI.

Castro Valley, Calif.

Viacom International: VOD trial to 600 subscribers. **America Online:** Testing of data delivery via cable in partnership with Viacom.

Redwood City, Calif.

TCI: VOD trial to 400 subscribers.

Cerritos, Calif.

GTE Corp.: Trial since 1989 of interactive shopping and education and shopping services. **Apollo Cablevision:** Interactive trial scheduled.

El Cajon and San Diego, Calif.

Prodigy Services Co.: Trial of data delivery via cable in partnership with Cox Cable Communications. **Pacific Telesis:** VOD trial via hybrid fiber/coaxial network.

Boise, Idaho

US West: VOD trial. **Bell Atlantic and TCI:** Network upgrade planned for 1995.

Omaha, Nebr.

Cox Cable: VOD trial in partnership with IBM Corp. and Zenith. **US West:** VOD home shopping trial to 10,000 subscribers in partnership with Digital Equipment Corp. and 300 Co.

Minneapolis-St. Paul, Minn.

US West: VOD service planned.

Birmingham, Mich.

Ameritech Corp.: Home shopping service to 46 subscribers.

Rochester, N.Y.

Rochester Telephone Corp.: VOD trial using ADSL with coaxial copper phone lines to transmit digital data. **Time Warner:** Network upgrade for future FSN.

AT&T: Asynchronous digital subscriber line.
FSN: Full service network.
MSO: Multiple systems operator.
VOD: Video on demand.
VOD: Video on demand.

Exeter, N.H.

CompuServe: Trial of data delivery via cable in partnership with Continental Cablevision.

Boston, Mass.

NTN Communications: Interactive services to 8,000 subscribers in partnership with Continental Cablevision.

Connecticut

Southern New England Telephone: VOD trial using hybrid fiber/coaxial network. **TCI:** Network upgrade for future FSN.

New York, N.Y.

Bell Atlantic: VOD trial in partnership with A.C. Nielsen Co., IBM Corp., and Time Warner. **Time Warner:** VOD trial using hybrid fiber/coaxial network. **NYNEX Corp.:** VOD trial via hybrid fiber/coaxial network.

Chatham, Dover, Florham Park, and Madison, N.J.

Bell Atlantic: VOD trial using hybrid fiber/coaxial network. **Sammons Communications:** VOD trial.

Alexandria, Arlington, and Fairfax, Va.

Bell Atlantic: VOD to 8,000 subscribers in partnership with Continental Cablevision. **Time Warner:** VOD trial using hybrid fiber/coaxial network. **MSO:** Multiple systems operator.

Manassas, Va.

GTE: VOD trial via hybrid fiber/coaxial network in partnership with AT&T.

Denver, Colo.

US West: VOD trial in partnership with TCI. **TCI:** VOD trial in partnership with Microsoft Corp. since 1992, planned test of interactive services in partnership with Microsoft Corp.

Tucson, Ariz.

TCI: Purchase of two cable systems, plan to build FSN to compete against US West and Time Warner FSNs.

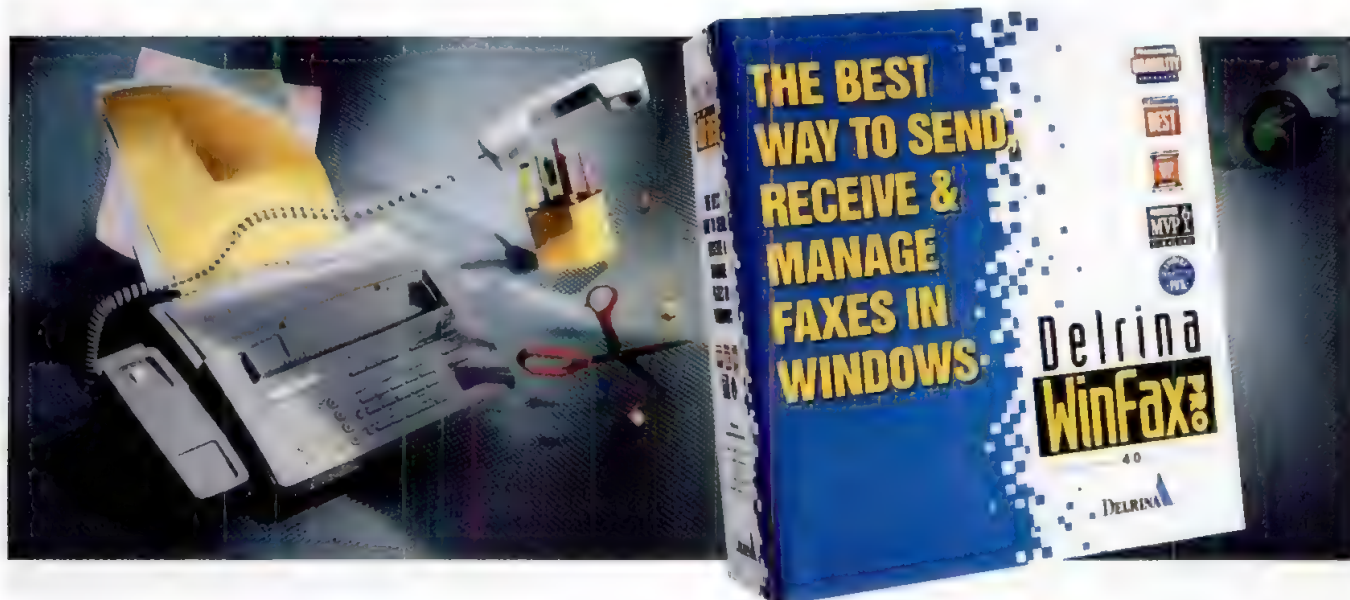
West Palm Beach, Fla.

Your Choice TV: VOD trial since 1993 in partnership with cable. **Newhouse Broadcasting:** VOD trial.

Dallas and Richardson, Tex.

Sammons Communications: VOD trial. **Southwestern Bell Corp.:** Upgrade to hybrid fiber/coaxial network for VOD trial.

Introducing Delrina WinFax PRO™ 4.0. You'll wonder how you ever faxed without it.



Met the fastest, easiest, most convenient way ever to handle all your faxing – new Delrina WinFax PRO™ 4.0, the latest version of the best-selling fax software in the world. The only one that combines the advanced faxing features you need with astonishing new ease and usability.

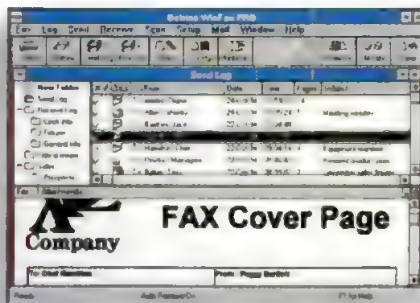
"The best fax package there is."

That's what *PC/Computing* said about version 3.0. And now we've made it even better.

Starting with the revolutionary new streamlined interface that makes it simpler than ever to do anything you'd do with a fax machine, and a lot more. Like sending faxes directly from within any Windows application as easily as you'd print. Or organizing sent and received faxes in convenient

folders. Or converting faxes into word processing documents with OCR.

There's added convenience with dozens of ready-to-use cover pages. Fax phonebooks that are drag-and-drop simple. And improved fax annotation tools that even let you add your signature.



Based on extensive usability testing, the new customizable interface includes folders for organizing sent and received faxes.

Don't try this with a fax machine.

Imagine faxing, not just an image of a document, but the actual file itself*, so it's ready to be used in an application. Imagine sending a single document that is automatically faxed to some people and e-mailed to others.

Now imagine you're on the road, and WinFax PRO automatically forwards faxes to you. Or lets you retrieve faxes sent to your regular fax number*. And there's more.

Get new Delrina WinFax PRO 4.0 today and put faxing where it really belongs – on your PC. Call now for information or to upgrade from WinFax PRO or WinFax LITE™. Or see your local dealer to upgrade immediately.

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CIRCLE 250 ON READER SERVICE CARD

gence, but this industry moves fast. The convergence PC requires full 64-bit capabilities controlled by a multitasking OS, a fast internal bus, fast video, and lots of storage. But we've already reviewed systems like that, and their numbers are growing while their prices are shrinking.

IBM, Intel, Microsoft, and Novell are developing new industry standards and products for the convergence PC. Intel's Pentium is being demonstrated at 150 MHz. The Peripheral Component Interface (PCI), a new PC architecture, is a good move toward allowing independent actions by the processor, memory, and communications peripherals. Intel's important improvements in PC-based videoconferencing include the Indeo video-compression technology. Novell's NetWare Video brings client/server technology to multimedia. Clients can access any CD-ROM that conforms to the Microsoft Video for Windows standards on a NetWare video server.

The PC also will have to interact with many information pipes in the convergence zone. These include both improved cable-television and telephone services. Wireless connections and even power lines are

vying for information transmission.

Companies such as Intel, working with General Instruments, and Zenith Electronics Corp. are preparing devices to link PCs into improved cable-television services. These so-called cable modems (a technically incorrect but catchy name) are being tested in two-way cable connections to America Online and Prodigy.

Asynchronous Transfer Mode (ATM) is a communications technique that delivers sound and images in synchronization. Although ATM was developed as a part of ISDN, ATM can run over cable's coaxial links, telephone's unshielded twisted-pair wire, and LAN cables. (The PC doesn't care where it gets its voice and video data—just that it gets it.)

The technology convergence—the digital “superhighway” to many—isn't mysterious. It is simply the continued convergence of the PC with user ingenuity.

—Frank J. Derfler, Jr.

The average PC has a ways to go before it is the perfect gateway to convergence, but this industry moves fast.

across the phone line and screen images return in the other direction. The application programs run in the networked PC and the files stay on the LAN.

The screen images in Windows and graphics applications can take several seconds to transmit this way, so vendors are fine-tuning them. Products such as Norton Lambert's Close-up, Central Point Software's Commute, Triton Technologies' Co/Session, Symantec's Norton pcAny-

where for Windows, Ocean Isle Software's ReachOut/Total Remote, and Avalon Technology's Remotely Possible use data compression, screen caching, and other techniques to speed screen transfers.

Some applications, such as WinView for Networks, from Citrix Systems, do things a little differently. Under control of its OS/2 base, WinView makes virtual network sessions available to callers, so one PC can serve many remote-control callers. Some programs, such as Travelling Software's CommWorks or the dial-in clients for cc:Mail, Lotus Notes, or Microsoft Mail use communications processes customized for slower links, so they are ideal for checking your e-mail or transferring files over a wireless modem connection.

The remotely controlled device on the network can be either a single PC or a cluster of CPU cards in a cabinet. Cubix

The Mobile User

You don't have to work in an office to be productive.

Network remote access is spinning upward on everyone's list. Laptop computers are outselling all other systems, federal and state regulators are pushing employers to cut commuting miles, and people whipped by windstorms, floods, earthquakes, and cold have learned that you don't have to go in to an office to be productive.

Almost every business network needs a way for people to call in to read and exchange files. Those files can be e-mail, reports, product orders, and the like. But regardless of the application, the process falls into one of two modes: *remote control* or *remote node*.

Remote control is what you want if your users primarily run DOS applications on their portables or are using slow transmission techniques, such as cellular

or wireless connections. Under remote control, the calling PC sends keystrokes

The Need for Speed

The appeal of faster transmission technologies goes up proportionately with the size of files you need to transfer. In addition, file transmission times vary according to packet size and the amount of overhead the connection requires. Generally, the faster the connection, the larger the packet size and the greater the overhead per packet. We calculated the net size—in bits—of the file to be transmitted by using the original file's size, the medium's packet size, and the amount of overhead per packet. We divided this number by the medium's connection speed to determine transmission time.

Hours minutes seconds	14.4-Kbps modem	ISDN (128 Kbps)	T1 line (1.544 Mbps)	ATM over a WAN (45 Mbps)	Fast Ethernet (100 Mbps)	ATM over a LAN (155 Mbps)
Large text file (100K)	0 01 11	00 00 07	<00 00 01	<00 00 01	<00 00 01	<00 00 01
.GIF image file (300K)	0 03 33	00 00 20	00 00 02	<00 00 01	<00 00 01	<00 00 01
CT scan (10MB)	2 01 22	00 11 16	00 00 56	00 00 02	00 00 01	00 00 01
X ray (20MB)	4 02 44	00 22 32	00 01 52	00 00 04	00 00 02	00 00 01

File transfer times decrease as data transfer rates increase

Overview

Corporation and J&L Systems specialize in this kind of multi-CPU card cage, which allows you to set up installations with excellent reliability.

If your remote users carry powerful laptops loaded with Windows applications, you'll be happier with remote-node access. A remote-node PC treats the modem as a LAN adapter. This technique, however, requires the fastest modems and careful setup to be effective, because the network data can quickly overwhelm the typical

Remote-node access requires the fastest modems and careful setup, because the network data can quickly overwhelm a typical modem connection.

modem connection.

The simplicity and small size of many remote-node server devices that sit with the LAN is appealing. Centrum, Gateway Communications, Microcom, Shiva, and U.S. Robotics, among others, market devices that are part LAN adapter, part modem, and part router. Basically, you plug a LAN cable in one side, a telephone cable in the other side, slide the unit into a rack, and start calling.

DCA, Microsoft, Novell, and Stampede Technology counter a product like Shiva's \$2,499 LANRover/4E by offering software solutions that you can load onto a PC. Novell's NetWare Connect NLM, \$595 for a two-port version, runs in an existing file server. Microsoft's Remote Access Service (RAS) comes free in Windows NT. But installing any of these products with the required multiport serial board and a LAN adapter can take your entire week's supply of skill and luck.

Remote-node and remote-control solutions are not mutually exclusive and many LANs need both. You can typically buy one type or brand of device now without being tied in later, so you've got room to grow your remote-access connections.

—Frank J. Derfler, Jr. □



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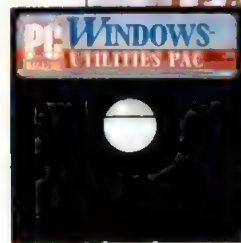
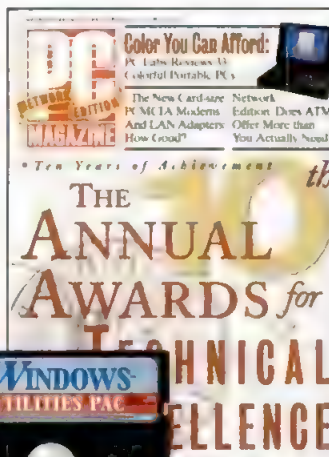
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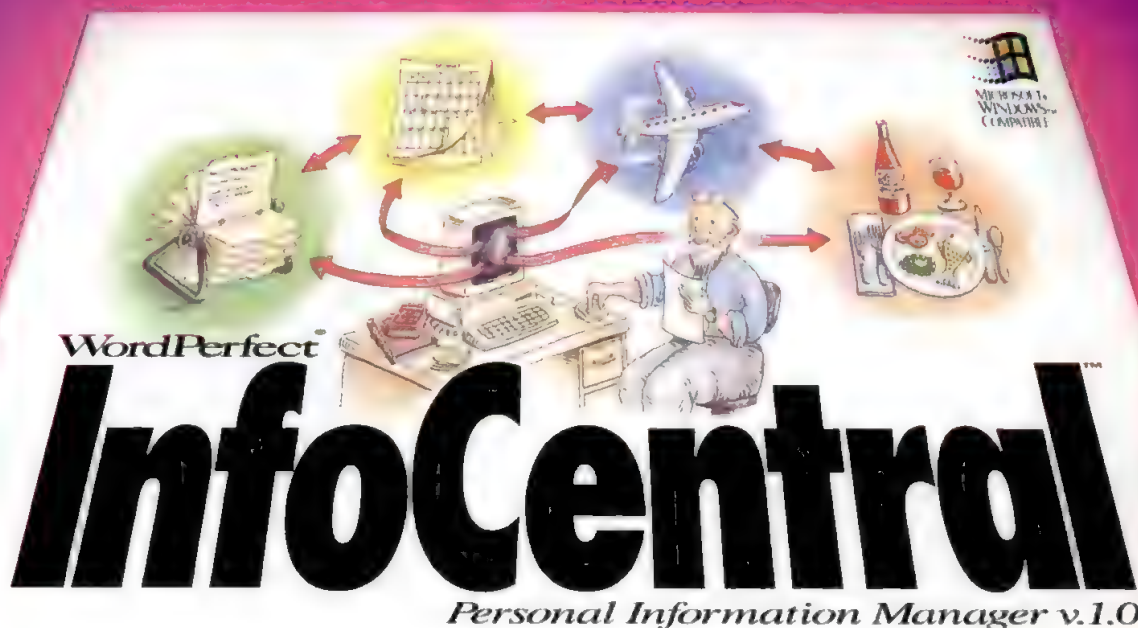
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Company Strategies

Coping
with

Change



As the office moves from standalone desktops to “group-think,” a company’s longterm strategy becomes as important as its product line.

By Gail Shaffer

As businesses and users embrace the new technologies that let them work together in new ways, they will begin to purchase applications with an eye to their true groupware capabilities and features. To keep pace with user expectations about workgroup computing, software companies are faced with several challenges.

They must produce applications that deliver on individual strengths but also work well together. They must offer a migration path from the standalone desktop PC to full-scale groupware and networking capabilities. And they must do so within an atmosphere of openness—developing their products’ ability to work with other vendors’ products and allowing other vendors to do the same.

Without a commitment from the software provider to groupware-enabled applications and integration with other applications, the user is left wanting. It’s more important than ever for your software provider to have a clear fix on the future. In our look at groupware products and enabling technologies, *PC Magazine* assesses each of eight major vendors’ strategies for delivering us into the changing office. We found a mix of approaches, each of which borrows to some degree from one or both of two different schools of thought.

One school of thought says that groupware-enabling features should be built in at the operating system (OS) level. The premise here is that with

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the abilities built in at so low a level, integration is ensured and new groupware apps can be developed without worrying about building in those features.

The other approach proposes to add groupware features directly into existing and new applications—but to engineer them so that they work well together. The benefit here is that you may not be as tied to a particular OS as with the first approach, and applications from different vendors may be more likely to work together if they're built on "groupware-enabling blocks."

Only time will tell which and whose approach will work best. Moreover, your choices will be determined at least in part by the software—and hardware—you already have installed.

FEATURES PLUS

From June 7 through June 9, you can go online to discuss strategies for the changing office of the future with editor-in-chief Michael Miller, editor Robin Raskin, and key executives from the companies in this story. Type GO ZNT:EXEC at any Compu-Serve I prompt.

ASKING FOR DIRECTIONS

We were pulling this issue together just at the time that Novell's purchase of WordPerfect was announced. That action seemed to speak directly to our whole focus for this special Changing Office issue. Although it remains to be seen what this move will bring, WordPerfect's longtime attention to applications integration and its commitment to workgroup software (embodied in WordPerfect Office) are a great

fit with Novell's networking bedrock. The purchase also addresses things that were "lacking" on both sides: applications presence for Novell, OS integration and strength for WordPerfect.

Notes was ahead of its time at its release. Now central to Lotus's future plans, Notes is well-established as the premier piece of workgroup software. As others throw their hats into the groupware ring, some of Notes's shortcomings will need to be addressed. Lotus has been working with third-party vendors to make sure their apps can work with the Notes database. Lotus's recent venture with AT&T, which will make it possible for a

public carrier to act as the data store, is an important strategic step.

Microsoft, not surprisingly, has an all-encompassing Windows strategy. It plans to deliver workgroup technology piece by piece in its applications but also build the technology into its OSs. Thus, Microsoft covers all bases: It keeps its applications intact by shifting users to new versions, yet offers workgroup features built into its OSs for software developers.

Digital Equipment Corp. wants to be a player in this atmosphere of applications glasnost, saying that it will be a provider of open systems. Digital is addressing some of its PC market shortcomings with LinkWorks, which provides an integrating framework for tying together the old and the new.

What's IBM going to do? So far IBM has been more successful with its open hardware than with open software. But it intends to play a part in the new "open database" view of the world. In some way this is simply a continuation of its ongoing mission to connect its mainframe-installed base with newer installations. DB2/2 and OS/2 are IBM's strate-

gic linchpins, but it is also preparing new applications to take advantage of both.

Apple sits squarely in the OS court, intending to build extensions into System software for third-party vendors to use. Apple continues to champion a consistent interface and offers developers a broad base of support and integration.

With its longtime focus on objects, Borland seems ready to deliver on everybody's quest for open data object exchange (OBEX in Borland's world). Borland also touts its strategies for enabling businesses to "upscale"—that is, to scale up easily—by offering a common interface to

small or large databases.

Taligent, a joint venture of Apple and IBM (with new partner Hewlett-Packard), holds enormous promise for the complete integration of workgroup capabilities. Its *frameworks* technology builds capabilities in at a very low level, yet gives developers manageable pieces with which to build applications.

Though mission statements like the following are the easier half of providing solutions, they can still help you decide where to place your bets.

There are two different approaches to group-enabling applications: building the abilities in at the OS level and adding them in (like blocks) to existing applications.

Lotus: Notes from the Future

Lotus Notes is more than just the heart of Lotus Development Corp.'s groupware strategy; it is the product that has essentially defined groupware for the market as a whole. Lotus has been committed to network applications—and Notes in particular—since 1989, well before networked applications were fashionable.

In the four and a half years since Notes was introduced, it has attracted more than 750,000 users, built an enthusiastic following in many important corporations, and defined the terms for all discussions of groupware. It's the target everyone else is aiming for. Notes owes most of its success to having a set of features that no

other single product has yet delivered. These include the following:

Notes has a document-oriented database system designed to handle loosely structured information. Notes databases are free of many of the limitations of more traditional database environments, such as fixed field lengths. Notes fields can contain a wide variety of data objects, ranging from fancy fonts and text colors to graphics, scanned images, OLE embedded objects, hypertext links to other Notes documents, and Notes macros presented to the user as push buttons.

Its user interface is suited to such information. The Notes interface is fairly limited but consistent, clear, and sufficient—

making it suitable for presenting a wide variety of different document stores to inexperienced users. Because all Notes databases behave basically the same way, the user who has some experience with Notes can quickly get full value out of a new Notes database. This makes Notes the user interface of choice for any additional offerings over the corporate network.

It has a tight integration of mail and other forms of information. Notes isn't just mail-enabled, it's mail-integrated. Any Notes database can send mail to any other Notes database, and every user's mail resides in a Notes database. Thus, an application can send messages to an individual; an individual can send messages or forms to a database; and users' Notes mail files can be redesigned to meet a company's special needs.

Notes mail can forward any document in any Notes database to any user. And mail features—such as using the Notes address book to get correctly spelled names into the To: field of a memo—can also be used in other applications that don't obviously have anything to do with mail.

Finally, its sophisticated transportation, directory, and security infrastructure dramatically reduces the effort involved in deploying shared applications. The single most important chunk of this is Notes' replication technology. It can keep multiple copies of a database (which might be on LANs or on remote workstations) synchronized using periodic, background dial-up phone connections.

THE INTEGRATION FACTOR

Notes is now the core of Lotus's strategy for differentiating itself in the 1990s. Lotus officials like to refer to Notes as "the Network GUI" and position it almost like an operating system for developing and deploying network-based applications.

To that end, Lotus has begun integrating its desktop applications (such as those in Lotus SmartSuite 2.1 for Windows) more tightly with Notes, giving these products more network features.

For example, if a user of Lotus 1-2-3 for Windows, Release 4.01, also has Notes

installed and seeks to save a new spreadsheet, the 1-2-3 dialog box will present networked Notes servers alongside local and LAN drives as storage alternatives. If the user chooses to save the spreadsheet on a Notes server, then all other Notes users can access it. Notes provides version management, replication to other Notes servers, and security for the spreadsheet. The 1-2-3 user sees only the 1-2-3 inter-

Other software vendors, including Borland and Microsoft, intend to use the Notes data store and transport infrastructure in a similar manner. Lotus supports this plan, but believes its own applications will exploit Notes to a larger extent.

face and sees the Notes server as just another storage option.

One key to this integration is Notes/FX, a technology designed to tie applications in to the Notes data store. With Notes/FX, fields in applications can be tied to Notes fields; for example, a Notes database could track the total of expense accounts stored in 1-2-3 format.

Other software vendors, including Borland and Microsoft, have announced their intention to use the Notes data store and transport infrastructure in a similar manner. Lotus supports this plan, since it will build Notes acceptance, but believes its own applications will exploit Notes to a larger extent.

Many individual Lotus applications are also gaining more networked features. Lotus 1-2-3 for Windows, Release 4.01, added a Version Manager for tracking multiple users' changes to a range of cells in a networked spreadsheet. Lotus's Organizer PIM is gaining more network features, so it will be able to be used as a group information manager and group scheduler. Approach has always been

capable of accessing multiple database formats over a network, and these features will be enhanced in future versions.

Notes, of course, is not Lotus's only messaging product. Its cc:Mail electronic mail system is currently the single best-selling LAN-based e-mail program. In the long run, cc:Mail and Notes Mail will become better integrated via the Lotus Communications Server. This product,

expected in early 1995, will be available in a file server version (as an upgrade to the existing cc:Mail server) and in a client/server version. This will seem a standard upgrade to cc:Mail users, but Notes users will be able to use the cc:Mail user interface, which many people find has a better e-mail front end.

Of course, the messaging features of Notes and cc:Mail are currently supported in most

of Lotus's applications through the Vendor-Independent Messaging (VIM) standard. In the long run, Lotus expects to mail-enable its applications to support both VIM- and MAPI-based systems.

Lotus is also positioning Notes more and more as an application development platform. An upcoming product called Notes ViP (for Visual Programmer) provides a visual interface for quickly creating applications that query both Notes and SQL-based databases.

NOTES, NOTES EVERYWHERE

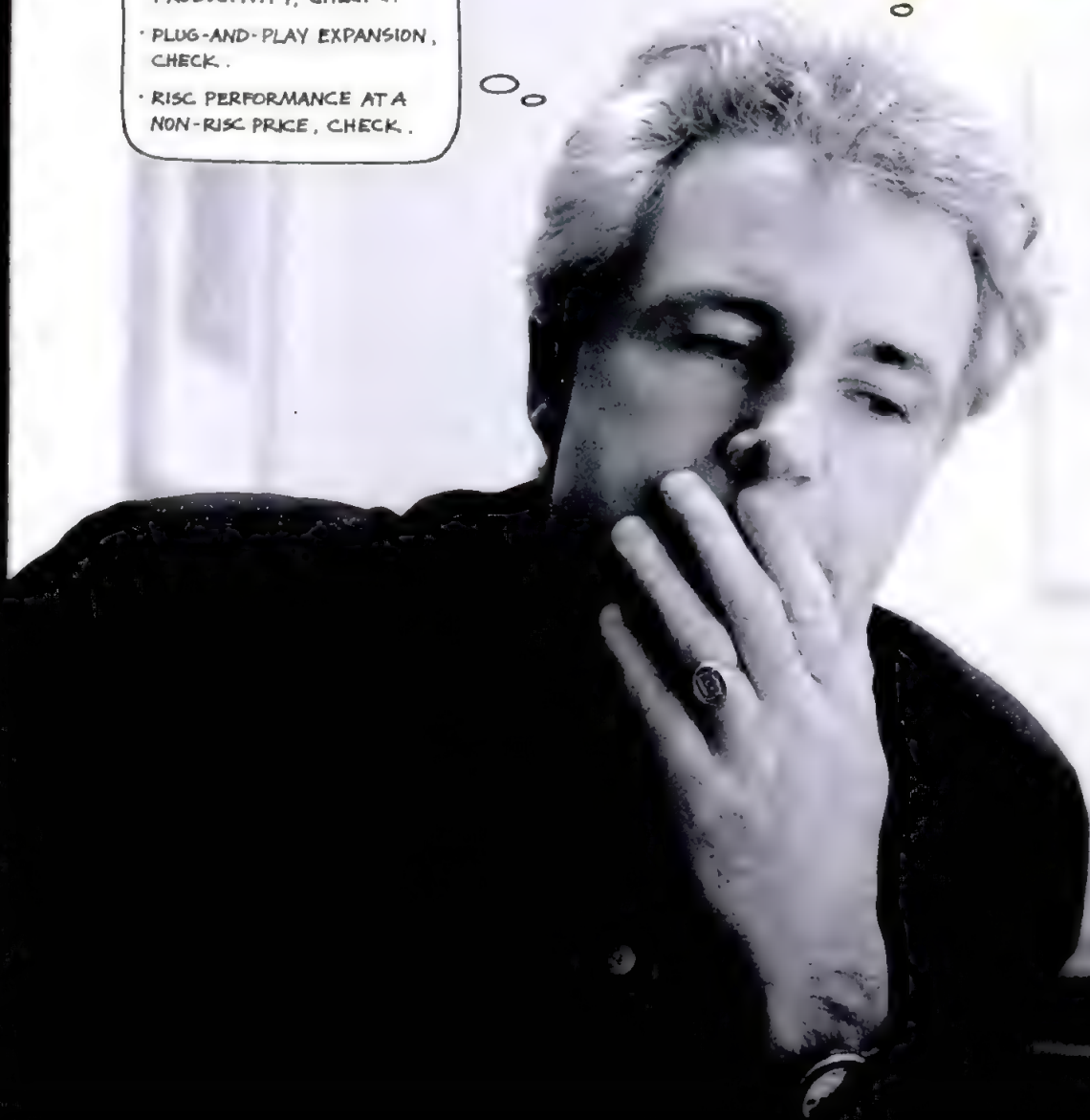
The golden eggs at Microsoft are DOS and Windows—inexpensive products that most PCs have to use. Novell's fortunes are based not on products that users are very aware of but on those that are essentially part of the plumbing.

Notes shares both of these characteristics: It's a presentation interface, and it's an important part of the network plumbing. If Lotus can broaden the popularity of the Notes interface while using the Notes infrastructure to group-enable products (Lotus's and other vendors'),

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- OUTPERFORMS 486 AND PENTIUM, CHECK.
- WORKS WITH MS-DOS, CHECK.
- WORKS WITH WINDOWS, CHECK.
- MEETS CORPORATE NETWORK STANDARDS, CHECK.
- INCREASES EMPLOYEE PRODUCTIVITY, CHECK.
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Alias Sketch!	Radius RocketShare
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Claris ClarisWorks	RasterOps Horizon 24
ClarisImpact	Ray Dream Designer
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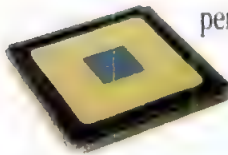
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But that's just the beginning. "By the end of 1994," wrote *PC/Computing*, "you'll see

then Lotus will push Notes to a place that shares the advantages of both Microsoft and Novell.

To advance its first ambition, getting Notes onto more and more desktops, Lotus has changed its distribution strategy since its product first appeared.

In the beginning, you could only buy Notes from Lotus, and you had to buy a minimum of 200 licenses for upwards of \$60,000. Notes servers had to be separate machines that ran OS/2; often, this was the only reason a company had for running OS/2. And Notes support came from Lotus, each year costing an appreciable fraction of the purchase prices. Only the rich and corporate need apply.

That's no longer the case. A couple of years ago, Lotus developed a reseller program, under which smaller companies could buy a couple of dozen Notes licenses plus support and (frequently) consulting services or vertical market Notes applications. The threshold dropped further in 1993, when Lotus Notes, Release 3.0, appeared. Now you can run the Notes server software on a Windows machine or a Sun Solaris Unix workstation, and a Notes starter-pack—one copy of the server software and software and licenses for

two end users—is on sale at your neighborhood software shop.

There's more to come. Lotus wants to turn Notes into a program that individual users might buy as client software for CompuServe-like database services. The March deal between Lotus and AT&T would have AT&T providing the services and Lotus creating a stripped-down, less expensive client version of Notes. Lotus also has visions of Notes becoming a great new publishing medium.

Notes is, without any exaggeration, the future of Lotus. While Notes still represents only about 10 percent of Lotus's billion-dollar revenues, it is by far the company's fastest-growing revenue source. Lotus's position in the networked applications market is currently unparalleled and gives Lotus a head start as network applications begin to appear from other vendors.

—John Helliwell

talking about distributed document processing for the second half of this decade. In that model, objects can be distributed anywhere on a network. Thus, you might create a report that contains text pulled from your own system, technical

drawings from the server in the engineering department, and spreadsheets from the finance department. You don't have to worry about where the various pieces are located or even what kind of computer they were created on. The system will take care

of finding, linking, and tracking that information, regardless of its location.

Moreover, WordPerfect has long believed that *groupware* meant something different from Lotus Notes. Its WordPerfect Office has met with a great deal of success and offers a wide variety of features—many of them now called groupware features—including e-mail messaging and calendaring. WordPerfect was able to offer forms-routing capabilities with WordPerfect Office by adding in its InForms product. In addition, WordPerfect acquired SoftSolutions and its namesake document management application in January. It has plans to create an information-sharing product to compete with Notes.

APPWARE EVERYWARE

Novell has also been moving toward a strategy of component network software, as emphasized by its AppWare strategy.

AppWare itself consists of a number of different parts. The first is the AppWare Foundation, a cross-platform set of common APIs that make the application independent of the OS, graphical user interface (GUI), and network services. Using this foundation, developers could create AppWare Loadable Modules (ALMs)—small networked components that provide access to the underlying OS, the GUI, and the network services. Examples of ALMs include those that would offer mainframe access.

In the short term, Novell becomes a player in traditional applications suites, but the longterm strategy also calls on WordPerfect's expertise to create new networked apps.

Novell/WordPerfect: Complementary Convergence

Novell's announced acquisition of WordPerfect in March set the stage for the combined concern to take a different approach toward the development of networked applications.

In the short term, Novell becomes a player in traditional application suites, with WordPerfect, Quattro Pro (which Novell acquired from Borland at the same time), and Paradox, which will continue to be licensed from Borland. But the long-term strategy is to combine WordPerfect's expertise in desktop applications with Novell's market-leading network services to create a new generation of network applications.

This strategy, called Novell GroupWare, seeks to combine WordPerfect's plans for a comprehensive series of networked applications with Novell's tradi-

tional approach to open network standards. The combined company sees standalone applications evolving into networked applications and component software and, from there, eventually into networked components.

BEYOND WORD PROCESSING

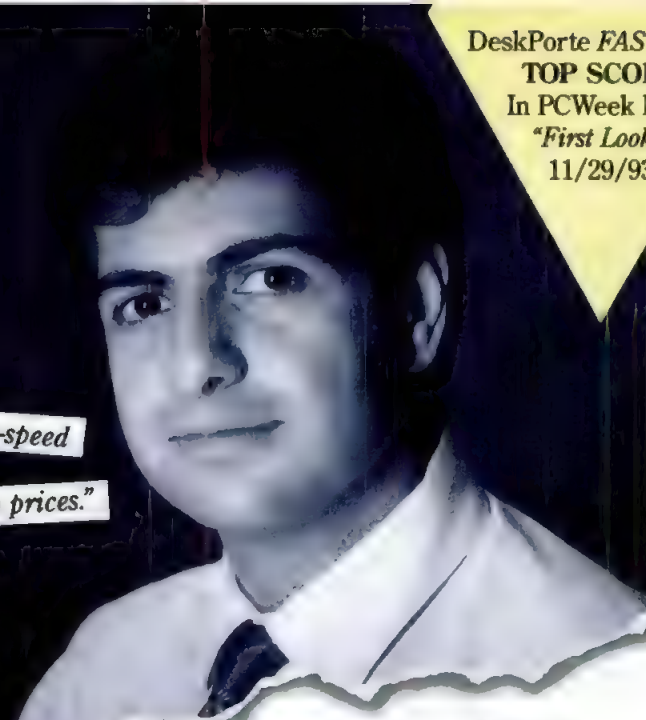
Even prior to the merger, WordPerfect had moved its focus from pure word processing to document processing, in which documents can act as containers for different objects—chart objects, spreadsheet objects, video objects, sound objects, and so on.

WordPerfect has been very committed to using Component Integration Laboratories' OpenDoc for breaking down its applications into objects. In fact, WordPerfect has been responsible for the Windows work on OpenDoc.

WordPerfect also had already begun

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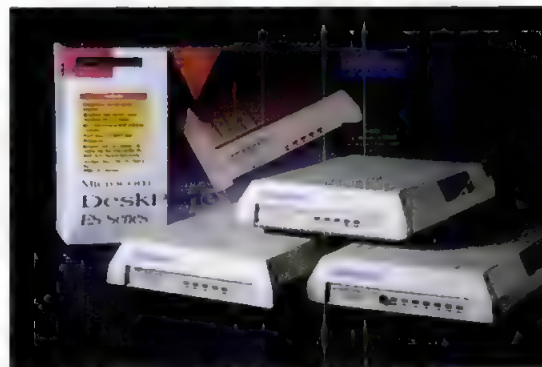
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MODEL	6480GM	1451GM	1482GM	1582GM	1765GM	1765GM	1765GM
Size	14"	14"	14"	15"	15"	17"	17"
Dot Pitch (mm)	0.28	0.28	0.28	0.28	0.28	0.27	0.26
Hor. Freq. (KHz)	30-30	30-60	30-62	30-62	30-65	30-65	30-65
1600 x 1200 HI	—	—	—	—	—	—	Yes (60Hz)
1280 x 1024 HI	—	—	—	—	Yes (60Hz)	Yes (60Hz)	Yes (75Hz)
1024 x 768 HI	67Hz/1	60Hz/NI	75Hz/NI	75Hz/NI	75Hz/NI	75Hz/NI	75Hz/NI
Mac Compatibility	—	—	Yes	Yes	Yes	Yes	Yes
Flat Square	—	—	—	Yes	Yes	Yes	Yes
Color Match	—	—	—	—	—	Yes	Yes
Digital Controls	—	—	—	—	Yes	Yes	Yes
MPP-4 & ISO9001-3	Yes	Yes	Yes	Yes	Yes	Yes	Yes
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The second piece is called the AppWare Bus. It's a software engine that manages the interaction between the ALMs, links them together, and defines their functions to create an application. This layered software approach looks a lot like the method Novell uses for its client requester software using Virtual Loadable Modules (VLMs).

Writing an application for AppWare in effect builds an application that can work with all other enabled system components across many different platforms, including Windows, Macintosh, UnixWare, SunOS, and HP/UX. Novell is hoping that many third-party developers will begin to

provide their own AppWare pieces, which will encourage growth in the collaborative, distributed, groupware, and workflow applications markets.

The various ALMs can then be tied together with Visual AppBuilder, a cross-platform visual development tool based on work from Novell's earlier acquisition of Serius Corp. Industry support for Novell's push into network applications development areas continues to swell. Borland, Gupta, and WordPerfect all have shown support for Novell's AppWare strategy. In January, more than 200 AppWare-based applications were available, and others are waiting in the wings.

RESULTS MERGER

Since the announced merger, WordPerfect and Novell have started work on converging the messaging architectures the two companies bring to the table: the WordPerfect Office messaging system and Novell's Message Handling System (MHS). MHS is used today by e-mail front ends such as DaVinci, BeyondMail, and Notework. Novell says that between WordPerfect Office and MHS-based products, the two back ends combined have the largest share of any of the e-mail back ends currently in use.

These two messaging systems will be

combined into a single Open Messaging Environment (OME) that is designed to act as an open superset of both MHS and the WordPerfect Office messaging system. Novell says that OME will be based on Microsoft's Mail API (MAPI) with unique extensions and will work across OS platforms.

OME is designed to be an open messaging server, supporting front ends from multiple companies. Novell's front-end tools—including future versions of WordPerfect Office, InForms, and SoftSolutions—will work with OME and other messaging servers.

Indeed, WordPerfect has already announced that

WordPerfect Office will work with MAPI. The company has been working for some time on a substantial number of gateways, both to other e-mail services and to other kinds of devices, including wireless, paging, fax, and telephone systems.

Novell foresees a tighter integration over time between its applications and the underlying NetWare network OS. For example, all of the elements of Novell GroupWare could eventually share direc-

tory services with NetWare itself. This strategy could also apply to applications development tools, with AppWare's Visual AppBuilder serving as the tool to tie together the various components of the GroupWare applications.

Today, for example, WordPerfect offers WordPerfect Office to view messages, InForms to view forms, and SoftSolutions to view documents. In the future, a collaborative viewer based on ALMs and Visual AppBuilder could be used to create single screens that query all different kinds of information back ends.

Novell talks about treating its own products as "most favored nations"—exploiting them to the fullest but leaving them open to other vendors. In this way, Novell believes it will offer cross-platform and open solutions—something it sees as distinguishing itself from Microsoft's Windows-centric view and Lotus's Notes-centric view.

This strategy (which would also apply to such other Novell products as NetWare, UnixWare, NetWare Loadable Modules, and directory services) follows Novell's traditional approach of "co-opetition," in which it both cooperates with and competes with other networking players. As Novell sees it, an industry-wide move toward open, network-based components will continue to grow the networking market and thus enable Novell itself to grow.

—Jesse Berst and Michael J. Miller

Microsoft: Give Pieces a Chance

Microsoft Corp. doesn't see workgroup computing as a separate product category. Rather than using specialized groupware, says Microsoft, you should "group-enable" your existing applications. To make this possible, the company intends to deliver workgroup technology piece by piece over time. Some of these pieces will show up in Microsoft tools and applications, others in its OSs.

THE PIECES CORPS

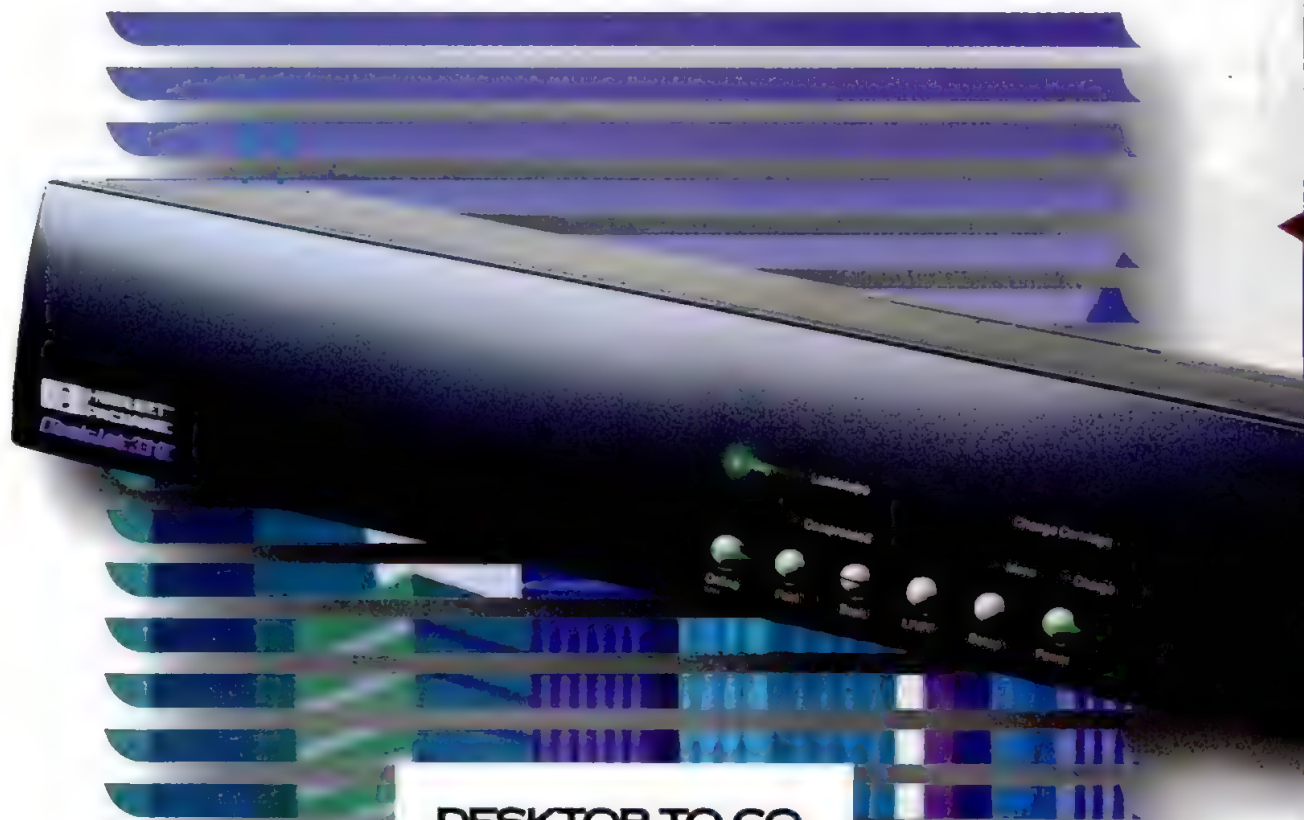
Microsoft says its piecemeal approach makes more sense than Lotus Notes, which it calls "monolithic" and "proprietary." Microsoft argues that the Lotus

"middleware" method forces users into a divided world. First they use some applications to complete their work. Then they have to use separate applications to collaborate. Microsoft claims that customers will gain more freedom if workgroup services are built into the OSs.

Microsoft's argument supposes that other applications are locked out from using Notes. In reality, Lotus is hard at work trying to convince other developers to Notes-enable their products. In addition, Microsoft's position ignores the fact that some users want to work with multiple OSs. A middleware approach lets you build applications that run on Windows, to be sure, but also on OS/2, Unix, and Macintosh.

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HOME:

For any reason or another, it's sometimes impossible to avoid having to bring work home. Occasionally, these trips can take enough time on the day to finish all your work to take it to the office. On the other hand, many people prefer the environment of home when working on certain tasks. Whether it's bookkeeping or letter writing, it's important to have the equipment and space you need at home to get work done.

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EXTEND YOURSELF

Microsoft says it will deliver on its groupware vision by extending its tools, applications, and OSs. It has already started improving its tools. Microsoft has released "workgroup extensions" for products such as Visual Basic and for programmable applications such as Excel, Access, and FoxPro.

Microsoft is also extending its applications. It is improving their access to data and mail, the two backbones of information storage and distribution. Nearly all Microsoft apps already have a

Send Mail menu option, and many products are gaining additional collaborative features. Excel, for example, includes a rudimentary facility for delegating a spreadsheet to multiple users.

It's not just the desktop apps that are gaining extra workgroup features. Microsoft is also improving its back-end services. It is building an advanced relational database engine that should be ideal for storing workgroup information. And it plans to come out later this year with a mail engine that can work across the entire enterprise.

MASTER PIECES

Still, Microsoft's operating systems form the real cornerstone of its workgroup strategy. The company says it will extend them to provide "an open workgroup foundation." When asked to explain, Microsoft usually falls back into marketpeak, saying it will "incorporate fundamental services and APIs that will make all applications workgroup applications in the same manner that printing became a natural extension of all applications in the 1980s."

What? Translation: Microsoft is going to build mail engines and database engines right into its OSs. Windows for Workgroups and Windows NT both ship with basic mail engines right now. Chicago (Windows 4.0) will add a universal e-mail client. And Cairo, the new version of Windows NT promised for 1995, is

based on an "object store" that will provide many functions now available in Notes.

The new OSs will add other features important to workgroup computing: standard directory services, robust security, and a common data access model. Since they will be available to all applications, it's easy to understand why Microsoft says these functions will provide a "workgroup platform." Sounds like a great deal. Buy the OS, get a workgroup platform for free. So when can

we get it? Ay, there's the rub. Since many of these features won't be available until Chicago and Cairo get out the door, users will be waiting for months, maybe years.

WAR AND PIECES

Microsoft has no intention of giving up on the groupware battle while waiting for all the pieces to come together. To create

workgroup solutions in the meantime, Microsoft has teamed with a small army of value-added resellers, integrators, and consultants it calls Solution Providers (SPs). Microsoft helps the SPs with technology, information, training, comarketing, and sales leads; the SPs provide knowledge of specialized markets, skills in integrating products from multiple vendors, and relationships with corporate accounts.

Microsoft's successful SP program gives it an advantage over most groupware vendors. That's one reason you'll rarely hear the company talking about workgroup products, but you will hear Microsoft crowing long and hard about workgroup solutions. Microsoft is able to point to actual, real-world applications as illustrations of its workgroup prowess.

There's a lot to be said for the Microsoft approach. Today, the company is training customers and partners to build custom workgroup solutions. Tomorrow, it will be putting even more workgroup power into its applications and OSs. Yes, Microsoft is late getting to the groupware party. But it's going to bring some great presents when it finally gets there.

—Jesse Berst

IBM: Adjusting its Sights

Recognizing the need to compete in software markets with LAN-based client/server solutions, IBM has shifted away from new mainframe-oriented applications toward distributed database software on all server sizes. IBM continues to build bridges and migration strategies from its older office solutions while pushing heavily into client/server software.

The company's groupware strategy begins with OS/2 and the DB2/2 database software on the server. The client side follows, with the OS/2 client available first and the Windows client shipping sometime later. As the sirens of market pressure urge IBM onward, it too recognizes the increasing demand for more open systems, using client/server technologies with distributed object-oriented techniques.

IBM is making sure its host databases support industry-standard data inter-

faces like Open Database Connectivity (ODBC). An ODBC driver for IBM's Distributed Relational Database Architecture (DRDA) is in the works and will provide distributed access to IBM hosts over Systems Network Architecture (SNA).

It also joins others in creating servers compliant with the Open Systems Foundation Distributed Computing Environment (OSF/DCE). IBM already supports many OSF/DCE components on its AIX and OS/2 operating systems. And support is growing for TCP/IP and Ethernet, long considered more open than IBM's SNA. Besides open computing solutions, IBM's new software relies on client/server databases to help distribute data and computing power. DB2 continues as IBM's database server of choice on all its systems and is the basis for all new workgroup applications.

On the object front, IBM revealed new

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object-oriented development software last October. Its Smalltalk-based VisualAge applications development tool puts IBM in the middle of the emerging object-oriented programming fray. IBM aligned itself opposite Microsoft's Object Linking and Embedding (OLE) compound document architecture in favor of OpenDoc, provided by Component Integration Laboratories and aligned with Apple.

IBM continues to create alliances for its System Object Model (SOM) and Distributed SOM (DSOM) object brokers while supporting the general interoperability directions of the Common Object Request Broker Architecture (CORBA) standard. Its job became more complicated as it merged Hewlett-Packard's Distributed Object Management Facility (DOMF) with SOM. Both companies recognize that their ultimate object directions will be in the use of Taligent frameworks, which include licenses for DOMF and HP's OSF/DCE implementation called DCE/9000.

Although emerging technologies suggest future products, IBM creates and markets many significant software solutions today, some based on older underpinnings. Offerings exist in almost every major category of office software, including workflow management, calendaring, scheduling, forms processing, e-mail, document management, and imaging.

IBM's FlowMark is its most recent entry into the increasingly popular workflow management category. This software takes a company's to-do lists and procedure manuals and graphically automates them to enhance and streamline office operations. As a real client/server object-oriented product, FlowMark provides a good start for long-lasting relations with automated offices. Expect this software to become the unifying agent for future workgroup applications. FlowMark is OS/2-based today, but IBM will add AIX clients and servers with a Windows run-time client soon.

Time and Place/2 is the calendaring/scheduling entry in IBM's new office strategy with Time and Place Connectivity/2 offering the links to OfficeVision and PROFS schedulers on their respective hosts. Requiring a NetBIOS network and IBM's DB2/2 database today may hamper acceptance of this product at many

corporate sites. IBM plans to support IPX/SPX and AppleTalk protocols.

Electronic forms is one of the hottest technologies in the changing office arena. IBM's FormTalk faces stiff competition from Lotus's new LotusScript-enabled forms software, Microsoft's Visual Basic-enabled electronic forms, and WordPerfect's InForms. This Vendor-Independent Messaging (VIM)-compliant software uses any VIM host system to route format. It also offers a standard suite of forms-routing functions. FormTalk's ability to integrate easily with FlowMark's work lists may be its most persuasive attribute.

IBM's traditional OfficeVision products include the capability to prepare documents, file documents, send and receive e-mail, maintain calendars, and schedule meetings. While it continues to support its

own office directions, it also markets and supports the use of Lotus's SmartSuite for OS/2 and recognizes Lotus Notes as a good ad hoc workgroup solution.

To ease the integration of LAN-based e-mail, IBM provides products like its Address Book Synchronization/2 and the Mail LAN Gateway/2, which provide cross-platform address and e-mail translation between LANs and host-based mail. IBM also offers a multitude of applications that fill the document management niche.

IBM recognizes that LAN-based workgroup software factors heavily in its future success. Remember, though, that those OS/2-tinted glasses may keep IBM from seeing opportunities on other platforms. Only time will tell if the OS/2-enabled workgroup dominates tomorrow.

—Gary Gunnerson

Digital: Open Season for Solutions

Digital Equipment Corp. wants to be "your open systems provider." The days of *only* VMS for your operating system, *only* DECnet for networking, and *only* Rdb for database are gone. In their place come OSF/1 Unix servers with heavy emphasis on TCP/IP.

As a heavy contributor to the Open Systems Foundation Distributed Computing Environment (OSF/DCE) technologies, Digital knows full well the direction that distributed open systems are going. DCE outlines three distributed computing models: the data sharing, client/server, and remote procedure call (RPC) models. In fact, Digital was a primary contributor to the RPC portion of DCE.

The company also addresses developing object standards through its alliance with Microsoft's Object Linking and Embedding (OLE) compound document technology and its Common Object Model (COM). This alliance sets it in opposition to IBM, Apple, and others, which support alternative compound documents (OpenDoc) and alternative object

models (DSOM).

Through this relationship, Microsoft receives access to Digital's ObjectBroker cross-platform object mediator. It thus can extend OLE to a distributed environment. Meanwhile, Digital folds OLE and COM into its host system offerings. Both sides continue to embrace the Object Management Group's (OMG) Common Object Request Broker Architecture (CORBA). However, object interoperability via CORBA between all competitors remains to be proven.

Given its new openness objectives, Digital faces a challenge to provide existing customers with methods of linking or migrating existing Digital solutions to the new platforms. Basic access to Digital hosts continues to be provided by PathWorks, which provides traditional Digital protocols. And TeamWorks provides intelligent access to its All-in-1 office products for LAN-based PCs. It is LinkWorks, however, that reveals the future for Digital's open client/server object-oriented technologies.

LinkWorks provides an integrating

Digital addresses developing object-oriented standards through its alliance with Microsoft's OLE technology and its COM specification.

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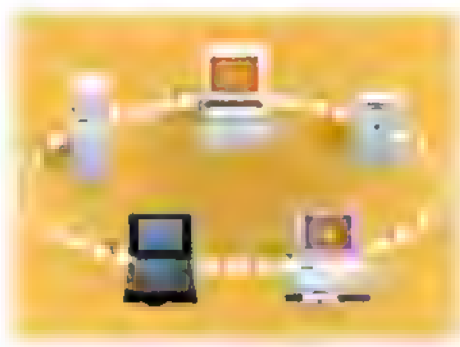
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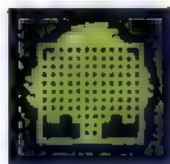
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framework that ties together traditional office software components with an object-oriented desktop metaphor. That means a company can use existing desktop and host applications under the LinkWorks unifying umbrella to automate business tasks. Digital's TeamWorks also can be used this way, but LinkWorks seems to be a very compelling solution for reengineering a company's processes.

On a desktop system running any of the Windows, System 7, OS/2 PM, or Motif graphical interfaces, LinkWorks presents itself as another windowed application. The LinkWorks window sports a traditional desktop metaphor including icons representing tools, applications, files, and container objects. Containers provide active icons that operate within a drag-and-drop framework to perform work. Some container examples are an e-mail in-box or out-box, a filing cabinet, and a graphical workflow map that illustrates an object routing path.

To underscore its openness, LinkWorks not only addresses separate clients but also integrates many standard desktop applications. And Digital doesn't stop there. Implementors of LinkWorks can choose servers based on DEC OSF/1, OpenVMS, Ultrix (no surprise so far, since all are Digital-supported already), SCO Unix, HP/UX, and IBM's AIX.

LinkWorks also stores its primary object, called a *cell*, in an open database system. Cells hold information about the user, his or her desktop, and associated security details. The cell concepts relate directly to their OSF/DCE counterparts. Your cell store can be Ingres, Oracle, Informix, or Digital's Rdb. Only two transport protocols make the cut list though, DECnet and TCP/IP.

NO CUFFS ON THESE LINKS

Perhaps the most intriguing aspect of Digital's workgroup direction is LinkWorks' seeming ability to please just about everybody. Integrators will like the tools' flexibility; MIS will hail the secured, controlled environment; managers will like the uniform look of the product on any desktop; and end users will love the ability to just get their jobs done.

LinkWorks heads in the right direction for a general purpose software tool that could work perfectly well without other Digital investments. As most of the large software vendors have found out though, tools like LinkWorks bring along considerable opportunities for additional revenue streams by helping companies to reengineer their businesses.

Another good reason for Digital's investment in this kind of open tool stems from its existing base of All-in-1 Digital shops throughout the world. Without LinkWorks, they could lose their customers to other solution providers.

Digital provides a very compelling product in LinkWorks, but it has its work cut out. Few smaller companies can afford to buy a hefty Unix server and database package to support LinkWorks. In addition, many sites continue to run networking protocols unrelated to Digital's DECnet or Unix's TCP/IP. Most sites support IPX/SPX, AppleTalk, or NetBEUI.

Don't forget the servers either—Windows NT, OS/2, and NetWare are missing as open options for storing LinkWorks information. Perhaps just a little more openness wouldn't hurt a bit and would really make LinkWorks the end-all integration product that Digital wants.

—Gary Gunnerson

runs on Mac desktop systems, and PowerShare, which runs on Mac servers.

PowerTalk, which started shipping with System 7 Pro last October, integrates e-mail into the OS. Using PowerTalk, you can send documents to others simply by dragging them over icons that represent users or groups of users.

You can also send documents to users directly from within PowerTalk-savvy applications. In that case, a standard dialog box appears that allows you to select the

Incorporating workgroup solutions into the OS gives users a single interface and enables Apple to guarantee a broad base of support to developers.

users who will receive your document. Furthermore, your PowerTalk in-box collects all of your mail types, whether they are spreadsheets or QuickTime videos, in one place.

PowerTalk lets you browse user lists via catalogs, which are directories that can contain descriptive information (such as company titles) in addition to names. PowerTalk catalogs let you manage e-mail addresses more efficiently and make it easier to send and access information. And PowerTalk also allows you to attach digital signatures to documents.

PowerShare brings these same technologies to the server. And third-party vendors can create gateways to interface Apple Mail with other mail systems such as the Internet or Microsoft Mail.

Companies can also create specialized applications using a technology called AppleScript to automate workflow procedures. With AppleScript, IS managers and commercial developers can create scripts that command standard Macintosh applications to perform tasks such as database queries or data backup.

Apple is working hard to bring AOCE and AppleScript-based technologies to the Mac desktop. At this point they still haven't reached the mainstream market.

—John Garriss

Apple: An Eye on the OS

The key to workgroup computing, in Apple's eyes, is in system software. Apple provides extensions to its operating system to introduce new technologies, and third-party vendors use these extensions to make their applications more powerful.

To Apple, incorporating workgroup solutions into the base OS has two main advantages. First, users have a single interface for everything they do. Second,

if new technologies ship in the OS, Apple can guarantee a broad base of support to third-party developers when they do make necessary changes to their applications.

Apple has created a technology framework, called Apple Open Collaboration Environment (AOCE), to facilitate the growth of what it calls "collaborative computing." The first two products stemming from AOCE are PowerTalk, which

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Taligent: *A Framework for Change*

In 1992, Apple and IBM spawned Taligent, a jointly owned company committed to designing next-generation operation system (OS) software. Nearly three years later, Taligent has cameoed some impressive proof-of-concept demonstrations but has not yet delivered the frameworks that would allow developers to create Taligent applications. Recently, Hewlett-Packard bought a 15-percent equity in Taligent and brought its distributed computing technologies to the party.

To ready yourself for Taligent, you need to believe in the operative word: *frameworks*. A framework is a collection of extensible object-oriented libraries that provide the foundation for applications. Taligent has an impressively large collection of frameworks it refers to as Application Frameworks. These include pieces to handle many of the graphics, database access, multimedia, user interface, networking, and distributed-component tasks of your application.

When the frameworks are built in to the OS at this close of a level, applications can require considerably fewer lines of code. It's an architecture that allows for rapid applications development as well as very rich functionality.

Apple and IBM agreed that in order to succeed—and to satisfy users who want a migration strategy—Taligent had to be able to sit on top of today's common OSs. The latest plans call for the Taligent Application Environment (which contains the frameworks) to run on top of

OS/2, AIX, and HP/UX (HP's Unix). Some will run on Apple System 7.x.

In addition, Taligent Object Services—a true OS—will be released next year. Object Services will sit on top of a Mach 3.0 microkernel. The microkernel can support several OS personalities on the same chip. Translation: You can retrieve data seamlessly from DOS, Unix, and OS/2, for example.

In addition to the Application Frameworks, its own OS, and its own developers' tools, Taligent is also developing a graphical user interface in which Taligent apps will run. Called People, Places, and Things, it uses icons to specify various pieces of office paraphernalia.

Taligent is hoping that developers will begin using Application Frameworks to create vertical, mission-critical apps and then move forward from there. But there is no clear strategy on how to move from today's apps to the world of Taligent. Currently, IBM is pursuing it more vigorously than Apple, and Taligent's strategy for running Windows apps is similar to everyone else's—emulation. Still, if Taligent pulls this off, the OS as we know it will undergo a radical revision, from a foundation for apps into an entire infrastructure.

—Robin Raskin

Taligent's frameworks
are extensible, OS-level
object-oriented libraries
that third-party developers
will use to build groupware
applications.

over multiple transports. Want to deliver your information over MAPI-compatible e-mail? No problem. Want to send it to some of your recipients via MCI mail? No problem. OBEX can mix and match transports.

The second key is getting the information in a usable form. With OBEX, you point at the information you want to send—a page in a spreadsheet, for example—and OBEX shoots it off to your recipients. What's more, OBEX sends editable data. The spreadsheet information, for example, can be pasted into a charting program and manipulated.

Third, the OBEX publish-and-subscribe metaphor solves the problem of maintaining links. When you "publish" information, you specify recipients. The OBEX engine on your system first stores the information, then sends it out. On a LAN, it sends out the data

at specified intervals; otherwise it waits until you are connected to a mail service.

Your "subscribers" also have OBEX engines, which receive the data and store it. Once you've published information, you can change your original data and issue new versions. OBEX automatically takes care of delivering each version and making it available to the right people. Once you've established a publication, your subscribers receive the data automatically whenever it is updated.

None of this magic happens, however, unless applications support the OBEX engine. Borland's Paradox database talks to OBEX and so will the applications from Novell/WordPerfect. Borland hopes to convince other companies to support the technology as well.

Borland is also pushing a strategy called "upsizing." The idea is to make it easy for customers to scale up their solutions—that is, to start small, then expand to entire departments or even entire companies. Borland products, thus, will be usable on a standalone basis or as the front end to a client/server application.

—Jesse Berst □

Borland: *Shootout at the OO Corral*

Borland made the move to objects long before most software companies. Now it thinks it can use its object-oriented (OO) expertise to empower the office of the future.

Sharing information is at the heart of collaborative computing. Most of that sharing occurs via deferred connectivity. You store data in a central repository and your colleagues pick it up later. Borland's Object Exchange facility (OBEX) pro-

vides a place to store shared information as well as a mechanism for passing that information around. More important, Borland says, OBEX solves three crucial problems.

The first problem is getting the information to the people that need it. Although mail engines and products such as Notes allow store-and-forward messaging, they require that everyone use the same system. By contrast, OBEX goes

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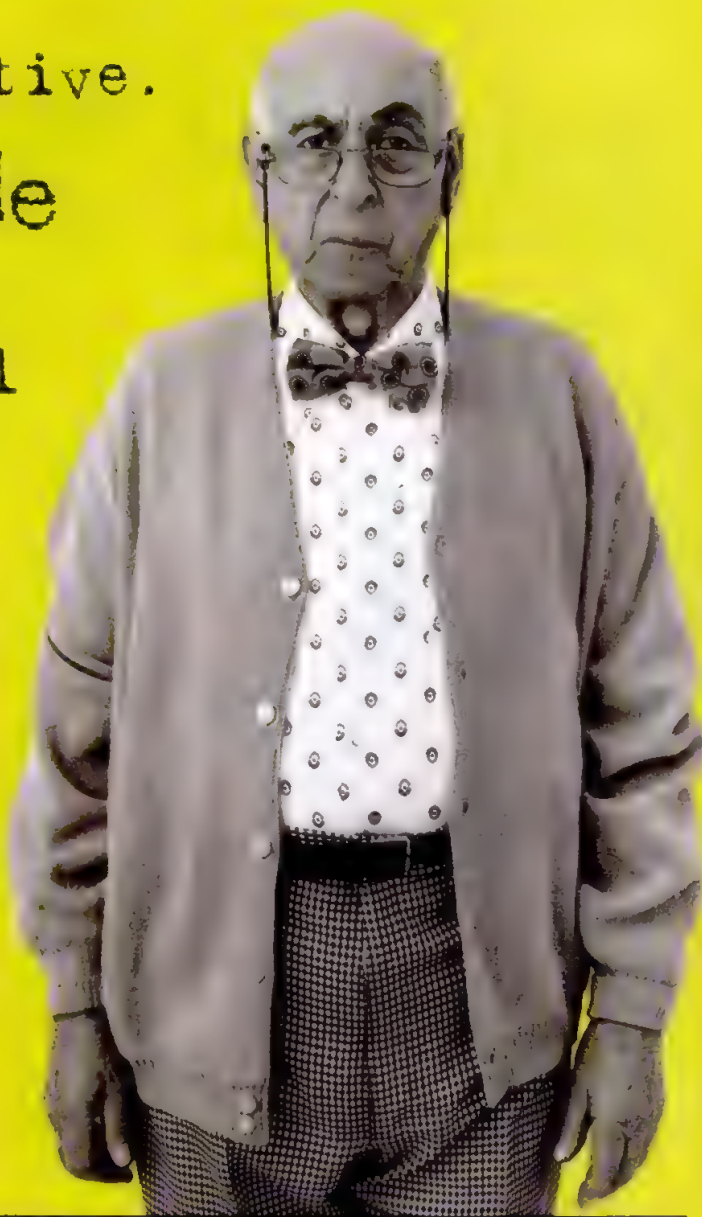
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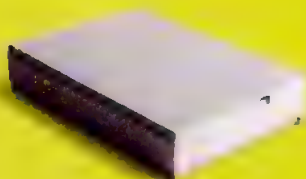
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CIRCLE 344 ON READER SERVICE CARD

Workgroup Computing

Group Enabled



Welcome to the workgroup zone. Prepare to enter a space where you'll find the first comprehensive guide to groupware, *PC Magazine* style.

By Rick Ayre and Ben Z. Gottesman

Welcome to the world of workgroup computing. If you're like us, it's not the first visit you've paid. Last year when we visited this terribly muddled area, Lotus Notes nearly defined the category. At that time, we railed that there were far too many pundits but no clear, coherent definitions for workgroup computing. In the year that's gone by, we've encountered even more pundits and certainly more definitions, but little clarity. So we took it upon ourselves to create our own definitions.

As you can tell by the number of products reviewed in this issue, there are many more products laying claim to the term *groupware* than ever before. The good

news is that we finally understand enough about groupware to get more granular about its definition. Now we've begun to create a hierarchy of products that fall under the groupware rubric. As we filter the products into different categories, we increase your chances of making a fair comparison between one product and another.

That's not to say that a groupware purchase is easy. Ultimately, when thinking about groupware, you begin to realize that you are searching for a capability and a process as much as an application. For these reasons, we have spent considerable time creating the flowcharts and diagrams that accompany this story. They're meant to help you find the capabilities you need, put products together, and guide you to the product

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● As a groupware development platform **Lotus Notes, Version 3.0**

Lotus Notes has been to groupware what 1-2-3 was to spreadsheets: It has defined the category. Yet for much of the four or so years that it has been on the market it has been characterized

as something of an oddity—and poorly understood.

We have always appreciated Notes for its unique strengths, but as a magazine with an identity defined by Labs-based product testing, we faced a quandary. What products could we compare with Notes? For the longest time Notes not only defined the field—it was the field.

Now that Notes is selling like hot cakes, and everyone wants to have their products compared with Notes, we had high hopes at having finally arrived at an opportunity to review Notes as it should be reviewed: tested and compared in a head-to-head contest against the products with which it competes.

Things didn't turn out the way we thought. We did review Notes, but we still failed to find a competitor. Notes is discussed as an alternative to purchasing an e-mail system, but our choice in the e-mail category is still cc:Mail. Notes' conference features are presented in our story on general conference software, but we chose TeamTalk as our Editors' Choice. Notes' workflow capabilities are tested in an article where we chose Delrina FormFlow and Keyfile Enterprise Edition as Editors' Choices. In other words, Notes could be compared, but in reviews where discrete functions like workflow were the focus, it could not win.

Our dilemma remains. Clearly, as a whole, Lotus Notes is much more than the sum of its parts. It is capable of e-mail, conferencing, and workflow, but it is also capable of more. Even in the way it puts those three functions together, it can do more than any of the individual Editors' Choices. And since Notes is an open platform, you can choose add-ons, like LN/DI, if you want stronger document management or BeyondMail if you want better rules. Which is to take nothing away from the winners in these three categories.

Our thinking is that if you want a product that does one of these things well, go with our Editors' Choice for that story. If you want one product that is capable of doing all of those things and more, choose Lotus Notes. We award it an Editors' Choice, finally, because it deserves to be recognized for what it does well.

Lotus Notes is a tremendous platform on which to build groupware applications. In fact, as a groupware development platform, it is unrivaled.

reviews that address the type of problem you're trying to solve.

THE MEANING OF WORKGROUP

Workgroup software enables groups of people to communicate, share information, and automate the work process using computers. There are many elaborate theories about workgroups and workgroup processes, some of which are finding their way into workgroup software.

Does all this theory matter? If you want to reengineer your company and are looking for software to help, then you may be better off picking a model on which to base the changes. ActionWorkflow Manager, from Action Technologies, embodies this type of approach.

If, on the other hand, you are happy with and want to automate the process you already have in place, then you probably don't want software with such a structured theory behind it. Instead, you should look for a program that will help you streamline your existing process or one that lets your process evolve as you use it.

What types of processes should you consider automating with group software? Finding the answer requires you to look at categories of products and ask yourself some fundamental questions. First, what type of data do you need to share? Is it text? Is it images? Is it in a proprietary format? Next, you need to ask yourself about the flow of the data. Do you need a flexible flow in which, for example, you could send a document to anyone within your group? Or are you committing to a rigid workflow with an elaborate system of sign-offs? How do you plan to interact with the data: Is it a transactional model or a distributed model that relies on forms? And finally, you'll need to ask yourself about the communications process—the transport mechanism that keeps your group in touch with one another. Your answers to these questions will guide you through the flowchart, product index, and reviews that follow.

GUIDE TO WORKGROUP COMPUTING

The upshot of workgroup computing is that these programs are creating new ways of allowing people to share information. Since "groupware" is too broad a category to be useful in reviews, we've broken down the products into a variety of discrete pieces based on the type of group task you want to do.

These sections can be grouped into three large categories. The first group is *communications-centric*, designed to focus and improve communications between groups. The second focuses on *moving structured information*, such as images and documents, among the people in your workgroup. The third group focuses on handling *transaction-based information*, such as real-time order entry.

Of the three broad categories, the last group, transaction-based information, is perhaps the clearest. PC users have become accustomed to thinking about different kinds of database engines and

Our Contributors: RICK AYRE is an executive editor and BEN Z. GOTTESMAN is technical director for software at *PC Magazine*. ANGELA GUNN is a frequent contributor to *PC Magazine*.

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development and query tools. We review such products on a regular basis, but they aren't our focus here. Instead, we're looking at the broader issues of sharing unstructured and structured communications in the new, emerging categories of groupware. The lines between all these products aren't completely clear—because many products attempt to cross boundaries—so we've tried to focus on tasks, and then break down those tasks into smaller pieces.

E-MAIL AND BEYOND

The communications-centric products involve something computers have attempted to do for a long time: foster and improve communications between groups. The information they share tends to be unstructured and ad hoc—like e-mail messages, bulletin board conversations, video conferences, or electronic meetings.

The best-known categories within this group are electronic mail and group scheduling. Electronic mail is the foundation of groupware. Not only does it handle basic electronic communications, but in most cases it serves as the transport for other groupware, like scheduling software and forms routing software.

Group scheduling software typically builds on the electronic mail, or messaging transport. It lets people schedule meetings more easily by taking into account both the schedules of individuals and the availability of resources, such as conference rooms. This category is evolving quickly, with the products adding more features—particularly those aimed at helping remote users.

Communications is expanding to encompass functions beyond those in traditional electronic-mail programs. For instance, we've yet to find a person who likes a meeting, but is the meeting hated or the fact that there's an incredible amount of time wasted waiting for it to happen and be done with? We look at 19 packages—some designed to facilitate a group of people meeting electronically at the same time and others more suited to bulletin-board-type conversations over time.

What if instead of using group scheduling packages to find a time where everyone involved in a process could get

E-Mail: Start with a Strong Foundation

By Rick Ayre

E-mail is the foundation of workgroup computing. Nothing is as fundamental to the success of a workgroup as its ability to communicate, and e-mail manages electronic communications for the workgroup. More than that, though, e-mail programs often provide transport and routing for other workgroup software, like scheduling and forms. When you choose an e-mail program, therefore, you supply more than just the tools to communicate.

No matter which program you choose for your e-mail, there are certain features you must have. The perfect e-mail client has a text editor that works like your word processor so that you don't have to learn a new approach to text editing. It has rules that are simple to program so that you can automate as much of the work as possible. Your e-mail program should be easy to figure out, and those features you use most often, like send and reply, should be a few clicks or keystrokes away.

Finally, you need to consider both the server and the client target platforms, as well as the transport mechanisms the mail program uses and the gateways it supports. For example, do

you want or need to dedicate a machine as a mail server? Big companies do, many small companies need not. Do you need Windows, DOS, OS/2, and Mac clients, or some subset? Would you prefer a proprietary mail-transport protocol, like that used by cc:Mail, or would you prefer some standard, like MHS? Will you need to connect only to like e-mail systems, or will you connect to e-mail systems from more than one vendor? To help you answer these questions, see our last e-mail roundup ("The E-Mail Personae," April 12, 1994).

CC:MAIL TOPS AT HIGH END

When we reviewed 11 e-mail packages in our issue of April 12, 1994, we gave our Editors' Choice to cc:Mail for Windows, from Lotus Development Corp. (Mountain View, California; 800-448-2500). It offered a strong set of administrative tools, a new improved Windows client program, and the best remote access program we have ever seen. Part of what we liked about cc:Mail was the way it could span multiple post offices with relative ease.

Finishing close behind cc:Mail for Windows was Microsoft Mail for PC Networks, our previous year's Editors'

together for a meeting, you could hold the meeting on your computers, with people joining in whenever they are able to? That's the theory behind conferencing software, ranging from Lotus Notes to TEAM Software's Channels. These conferencing packages are specifically designed to help you have a discussion on your computers using a LAN or a dial-up connection. Electronic conferencing takes traditional BBS conferencing and extends it with new features. For some people, however, the features found in today's BBS may be all they need. We

take a look at the conferencing capabilities of BBS software and also the BBS capabilities you might already have in your e-mail system.

If you're going to end up with a physical meeting anyway, some new packages are designed to help you make those meetings more productive. One of the interesting things about electronic-meeting support software is its roots in academia. These are programs designed by experts who suggest that it's the meeting process that's to blame for our frustration.

Choice. It was designed and built for the mobile professional and is still the best choice for those who use portables and docking stations or need to access their mailbox from multiple locations. It doesn't hurt that the Microsoft Mail Windows client is included with Windows for Workgroups 3.11 (as well as with Windows NT), the current Windows of choice. That makes it easy to check out the client interface and see if you like it.

EASIER MIDDLE GROUND

Although both cc:Mail and Microsoft Mail can serve the needs of large or small workgroups, they require hardware and personnel resources that small groups may not want to commit. For small workgroups, there are other programs that preserve the connectivity but are easier for qualified end users to install and administer. BeyondMail (Beyond, Burlington, Massachusetts; 617-229-0006), for example, offers strong rules, while Notework Electronic Mail (On Technology, Cambridge, Massachusetts; 800-767-6683) emphasizes cross-platform support.

Although other packages now offer rules, a feature BeyondMail pioneered, BeyondMail still stands out for having the easiest—and one of the most powerful—rules implementations. Easy to install and administer, it offers strong DOS and Windows clients.

Notework has a solid reputation for being small and simple. The features everyone needs most are the ones

you'll find in Notework. Notework also boasts one of the friendliest Mac clients, so if cross-platform support and ease are what you are looking for, look no further.

REALLY EASY: E-MAIL LITE

Three Windows-only e-mail programs—a la mail, eNote, and NvMail—are easy to set up and use. Each has its own personality, described in the sidebar "E-Mail: Lite and Easy" (*PC Magazine*, April 12, 1994, page 266). All three provide basic e-mail functionality and make modest resource demands compared with those of full-function packages. None, for example, require a dedicated mail server; instead they let you to locate your post office on a shared network directory or even a shared peer device to which all users have access.

AND DON'T FORGET NOTES

Though Lotus Notes is not a traditional e-mail package, it includes Notes-Mail. Notes gives you an adequate e-mail system, a lot of workgroup functionality, and a lot of overhead. It has benefits—and associated costs, among which are the considerable hardware it requires and the personnel to keep it running well. If you're willing to bear the cost, you get much more than mail: You get the unique advantages of the Notes discussion database and a wealth of workgroup functionality, all riding on a base that includes extensive multiserver and wide-area connectivity. □

We're also seeing products designed to share new kinds of information electronically. Whiteboard software is a sort of "poor man's videoconferencing." This new breed of software lets you use your computer to brainstorm with others by sharing the same document and application and to share the information with a group of what may be far-flung collaborators. All you need for this are traditional phone lines and modems.

Take this a step further and you move to full-fledged desktop videoconferencing. Andy Grove, the CEO of Intel, likes to tell

us that powerful microprocessor chips, like Intel's own Pentium, will herald a whole new era of computing that involves video and voice along with more traditional data forms. But while some people suggest that 1994 might well be the year of videoconferencing, remember how many times we experienced "The Year of the LAN." For the story "Seeing Is Almost Believing," *PC Magazine* Labs tested seven desktop videoconferencing systems, all of which require ISDN. We found some we can recommend and learned much about what it takes to make any of them work.

WHAT ABOUT MANAGING INFORMATION?

If this first group of products is designed to work with unstructured information such as electronic mail messages or video signals, the next group deals with the more concrete kinds of information we deal with everyday, ranging from forms to editable documents to bitmapped images, stored in a large, central repository.

Even within these products, whose focus is pretty heavily skewed towards managing information, there are two subsets. One focuses primarily on the storage, retrieval, and sharing of information. This information may be text or image based; some good examples of software in this category are programs like PC DOCS Open or PageKeeper. The other subset is more concerned with the process of flowing the data through the group. This group includes forms software and traditional workflow software.

Naturally these subsets are not so cut-and-dried in the real world. Keyfile, for instance, both archives text and data and flows it around the corporation. Lotus Notes is a veritable chameleon, depending on how good you are at developing applications with its basic tools. Notes changes colors, too, every time you add to it. Use Lotus Notes Document Imaging (LN/DI) or one of several other add-ons, and Lotus Notes becomes an image manager.

Even though these groups may not be truly discrete, we've managed to draw the important lines so that several large subgroupings can be made. The first of these is workflow automation software. With the largest review in the issue, this category is one where the action is really heating up. We take a long hard look at software that controls the flow of data, both document and image based, on the LAN. Workflow software is rapidly maturing, and these products hold enormous potential.

In the sidebar "High-End Workflow," we also look at high-end workflow products that take the same idea and move it to another scale. These programs tend to require a large degree of customization. Typically these are purchased from consultants who build and install them. These systems are expensive but may be worth the cost if you are redesigning a fixed process within a large enterprise.



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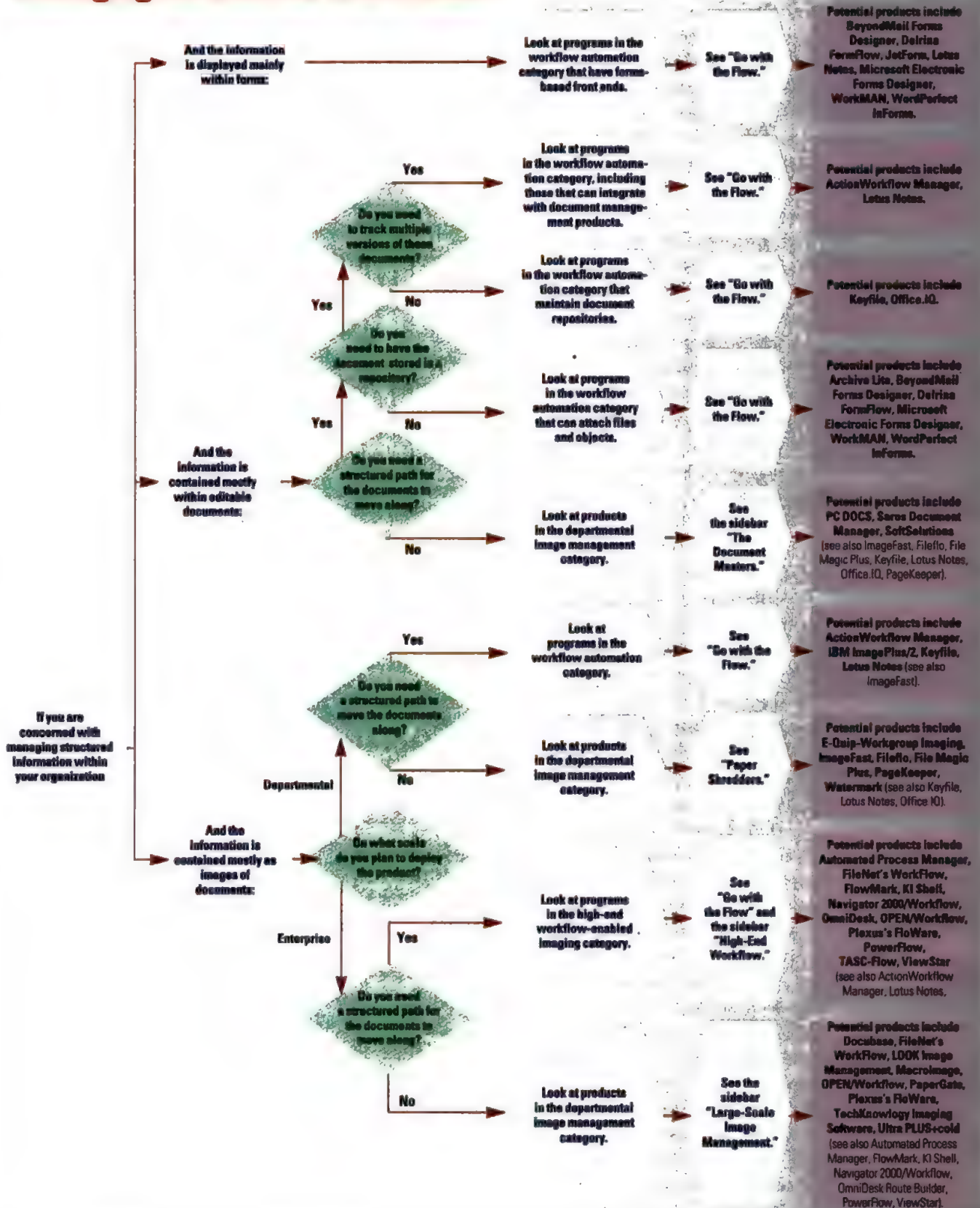
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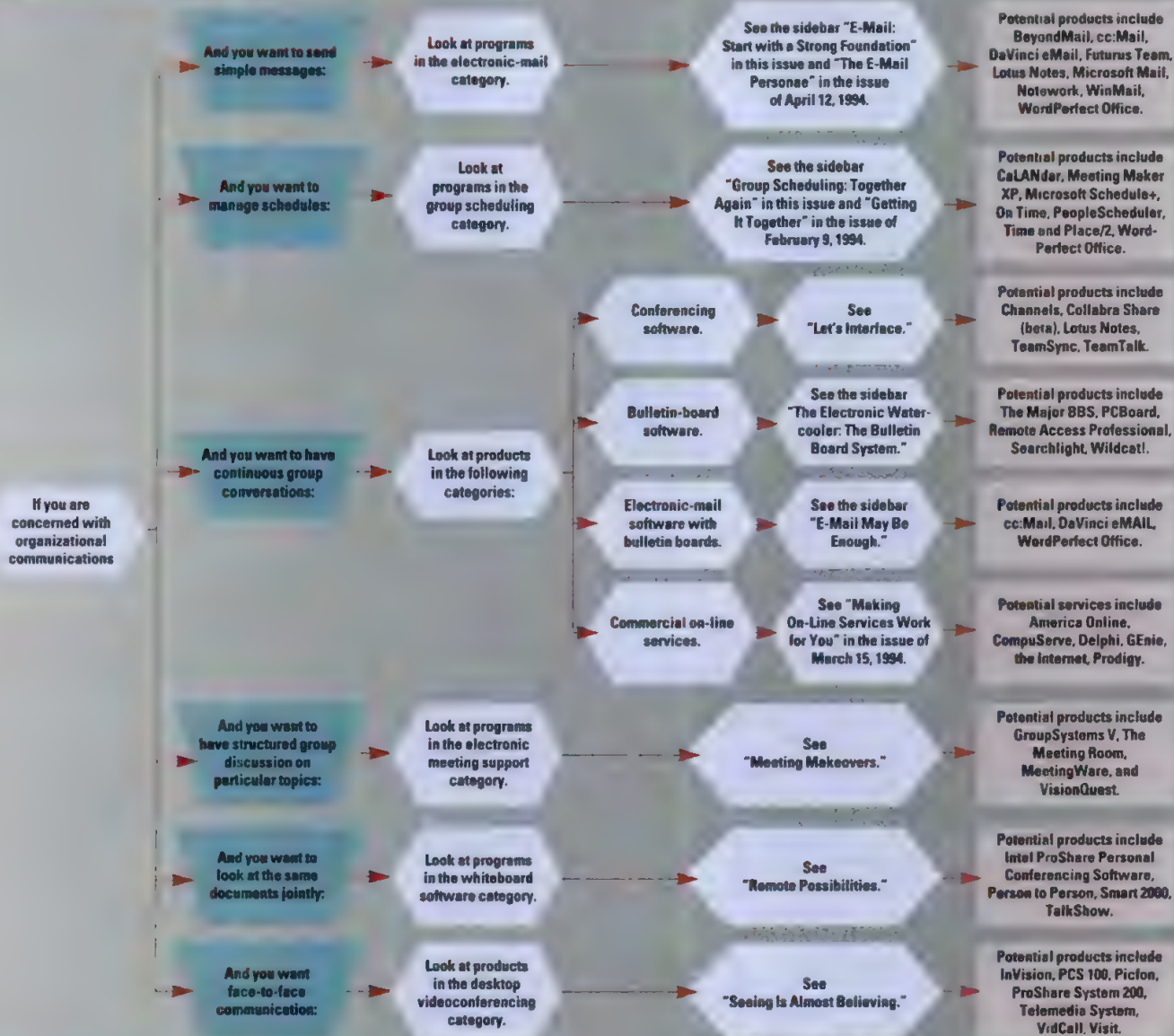


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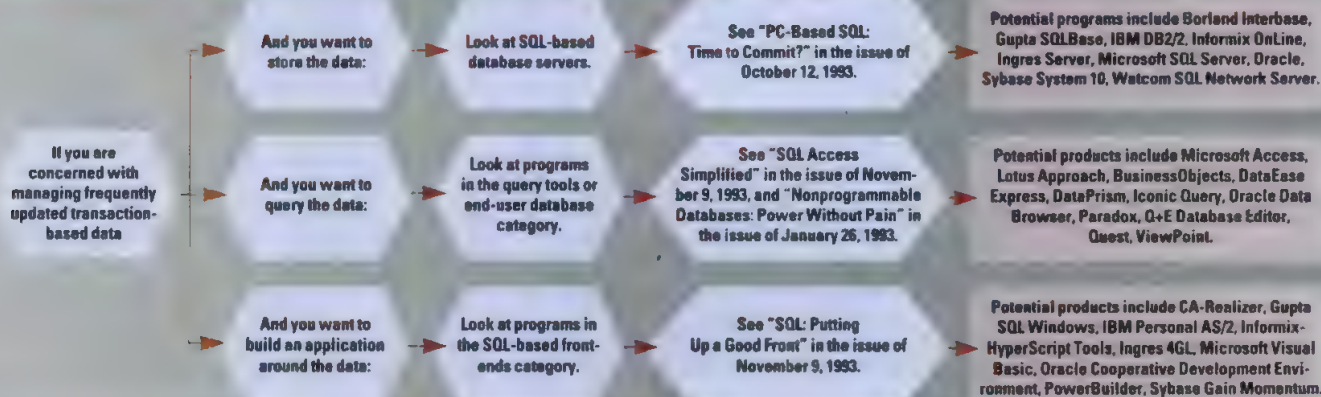
Managing Structured Information



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Group Scheduling: *Together Again*

By Angela Gunn

When last we compared scheduling software ("Workgroup Scheduling: Have Your Computer Call My Computer," February 9, 1993), we predicted that someday group-scheduling packages would simply become an integral part of a comprehensive set of workgroup software. That day is getting closer, but it's not here yet.

We have quite a progress report, though. E-mail, personal information managers, and contact managers have all added better support for scheduling. Dedicated scheduling software is more sophisticated, better designed, and more aware of the variety of resources, environments, and employee needs in the workplace. It is also just plain easier to use.

TWO NEW ADVANCES

There are two new products that bring a significant set of enhanced features to group scheduling: PeopleScheduler, from Adaptive Software (Newport Beach, California; 714-729-3180), and Time and Place/2, from IBM (White Plains, New York; 800-426-2255, Dept. 142).

PeopleScheduler rethinks the problems of scheduling employees in the mobile, nontraditional office. It is not intended as a meeting scheduler but as an employee scheduler—more like a project manager. As such, it is a well-conceived Windows and DOS scheduler, with an excellent understanding of the fine art of managing the morass of employee schedules found in the nineties office: full-time, part-time, flex-time, temp, salaried, shift-based, and hourly.

Each employee has a record in the system with information on typical availability, breaks, schedule, and skills. The schedule is displayed as a set of time bars in a chart; you can shorten, lengthen, and move the bars around to rework the schedule or even such minu-

tiae as employee breaks (the information updates automatically). Changes are updated in real time, and PeopleScheduler automatically flags conflicts. Attendance histories, personnel information, vacation schedules, and payroll data are equally easy to manage.

Time and Place/2 is a more traditional scheduler that runs on an OS/2 server and will support OS/2, Windows, DOS, and soon System 7 clients. What Time and Place/2 can claim beyond all the features you'd expect in a group scheduler is what IBM refers to as strong host connectivity. What that translates to, with the added Time and Place Connectivity/2 program, is the ability to link with OfficeVision/VM, OfficeVision/MVS, and PROFS schedules. Users of the LAN-based product will be seamlessly linked to those on the hosts; thus work-groups can span both environments.

OUR PREVIOUS BEST

Like the Adaptive product, Microsystems Software's CaLANDar (Framingham, Massachusetts; 508-879-9000; fax, 508-626-8515) was built specifically for network use. In our last roundup, Version 2.10m of CaLANDar received our Editors' Choice award.

We liked CaLANDar's flexibility and power but criticized its cluttered, cryptic Windows interface. Version 2.5 has improved the look and feel considerably. The package's support for enterprise-wide scheduling has also been enhanced; one feature, SuperVIEW, even allows you to monitor enterprise-wide activity based on keywords (for instance, project names could be checked to see if too much time is being devoted to one project).

The status of planned events is graphically displayed; one glance indicates whether everyone scheduled for a meeting has RSVPed and whether anyone has declined an invitation. CaLANDar is compatible with cc:Mail, Microsoft Mail,

VINES Mail, and MHS-based packages, which keeps users in the loop even if they don't use CaLANDar directly. It even reaches mobile users, via beeper. And the golden goal of cross-platform support is closer than ever, as a Macintosh client has been added to the Windows/ DOS product.

INTEGRATION

Some products have concentrated on integrating themselves with a particular e-mail package. Microsoft Schedule+ (Redmond, Washington; 206-454-2030) relies on Microsoft Mail (Version 3.0 or later); once installed, the program uses the mail transport agent, and scheduling traffic appears in users' regular mailboxes. If your LAN or WAN already uses Microsoft Mail, such integration could improve the likelihood that users will be reliable about using the scheduler—one of those intangible factors that makes or breaks the usefulness of any of these products. As with the Microsoft Mail client, Schedule+ is shipped with Windows for Workgroups 3.11 and Microsoft Office.

And in the realm of the thoroughly integrated, run-the-universe applications, there's WordPerfect Office, (Orem, Utah; 800-451-5151; fax, 801-222-5000) which encompasses group scheduling, personal appointment books, and e-mail; it operates over DOS, Windows, Mac, and Unix. WordPerfect Office requires dedicated DOS, OS/2, or Unix servers. It supports remote users with either one-way or two-way wireless connectivity, in this case through WordPerfect Office Remote, and with the ability to "read" the schedule to callers using Touch-tone phones. And access through dial-up workgroup messaging hubs means that users can share scheduling (and e-mail) information with other Office users, even those not on the same LAN. □

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Lotus Organizer 1.1	\$99.99
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Workgroup Product Index

These are the products we review in the following stories. Use the flowchart on page 178 to decide which products meet your needs, then use this index to find the reviews of those products.

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Workgroup Computing

If you have a lot of information but you don't need formal workflow, a large number of products are aimed at you. In the article "Paper Shredders," we look at a variety of products designed to get the paper off of our desks and replace it with electronic images. We look at a wide variety of products, ranging from turnkey solutions that combine hardware and software, to group solutions that incorporate OCR, to OLE servers that hook into other applications for storing and managing images.

The heart of "Paper Shredders" is a look at a new, emerging class of image-management software aimed at individuals and departments. These packages typically let anyone scan and manage bitmapped images of your documents—and do so very easily. In addition, we look at specialized products that provide similar capabilities but require their own hardware.

If you need to work with editable documents in a native word processing format, you might be better suited to a workgroup document management system. In the sidebar "The Document Masters," we look at such products, ranging from PC DOCS Open to SoftSolutions to Saros Corp.'s Mezzanine.

Finally, if you want to manage huge numbers of items in an enterprise, look at high-end image-management software. In the sidebar "Large-Scale Image Management," we look at a variety of products in this group, all of which are aimed at managing such documents. Some are even adding workflow features, bringing our reviews in this category full circle.

HOW TO FIND WHAT YOU WANT BUY

To help you navigate these reviews even further, we've documented our breakdown of the product categories in an impressive flowchart (earlier in this section). You can use the flowchart to direct your product search. As you path through the flowchart, your buying decisions will become apparent.

If you need software to facilitate unstructured communications, then you should be thinking about either e-mail, scheduling, or some of our meeting support software. If you need to manage data on a LAN, then you need to differentiate your data management needs even further. What kind of data needs to be man-

aged? What kinds of routing control are necessary? Do you need to manage images, images of documents, editable documents, or forms-based data? Do you need routing control over the files or the information in the files?

There are also a few general questions that are worth asking. One is whether you prefer an off-the-shelf solution or a custom solution. Do you want to purchase software that you can customize yourself or have it custom-tailored by VARs?

You should consider the issue of scalability. Scalable solutions meet your immediate needs and can grow to meet your future needs. In our testing, we look at how scalable all these systems are so that if you have modest needs now but expect growth, then you can choose products that will remain tenable over the long haul.

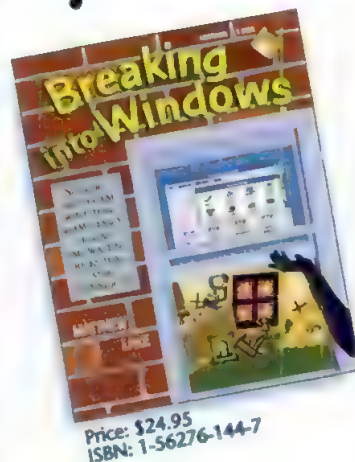
Finally, you should consider any new purchases in the light of what you already have in place. For example, if you are already committed to an e-mail system, you may want to consider buying other groupware that can use it as a transport and routing mechanism. That way you can use already existing address books, and administrators won't have to support two dissimilar network strategies.

There are many ways to approach the purchase of groupware. One is to buy a big solution, another is to buy the pieces one or two at a time. The PC way of doing things has typically been to buy the best individual products and combine them to build the solution that is best for you. The more traditional way—what we often think of as the MIS way—is to purchase one big solution that works for everyone in the company. Workgroup computing pits the two strategies directly against one another. (For a complete discussion of the vendors' long-term groupware strategies, see "Coping with Change" in this issue.)

The future for groupware looks bright for the users of workgroup products. Already-crowded markets, like workflow automation software, will get more so. Already-group-enabled products, like e-mail, will attempt to position themselves in the center of all the action.

Major PC software vendors are working hard to tie what they have today to where they want to be tomorrow—and where they want to be is at the core of workgroup computing. □

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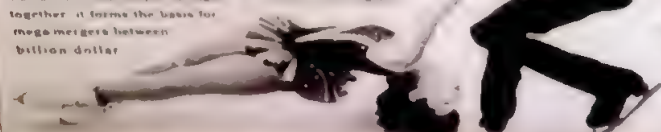
Compatibility (kəm-pat-ə-bil-ət-ē) *n.* 1. A feature rarely found in this category. *example:* The **TI microLaser™ Pro 600** gives you DOS, Windows, Mac, PCL5 and PostScript® compatibility standard; HP charges hundreds more.

TI MICROLASER PRO 600

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link them together.

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40MHz Processor Upgrade	Optional	Not Available	Not Available
Compatibility	DOS/Mac	DOS	DOS/Mac
Toner Cart. Life	15K pages*	6K pages	6K pages
Paper Trays	250/250 sheet	250/100 sheet	250/100 sheet
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CIRCLE 139 ON READER SERVICE CARD

Conferencing Software



Let's Interface

Most people can relate to the problems of planning meetings. With group conferencing software, you can conduct them without imposing rigid time constraints. *By Joe Salemi*

Meetings: They can be the bane of an organization's existence. It's difficult, if not impossible, to schedule them so that everyone who should be there is there. When finally held, the organization's production comes to a virtual standstill, since everyone who should be working is at the meeting instead. Even if these problems don't arise, meetings can still go awry. People show up ill-prepared to discuss the agenda, or a topic is introduced that sidetracks the entire meeting. Worse yet, the meeting might have to be postponed, or a new meeting scheduled, starting the cycle all over again.

Fortunately, it doesn't have to be this way. Plenty of tools exist to help solve the meeting conundrum.

In fact, some have been available for years. But only recently has the underlying technology, local area and wide area networks (LANs and WANs), been implemented widely enough to make it practical for many organizations. One of the newest solutions is electronic meeting support software (see the article "Meeting Makeovers," also in this issue). A somewhat more mature solution is group conferencing software.

Essentially, this technology lets organizations create meetings in which participants join in according to their own schedule. What it doesn't offer, for the most part, is any tools for distilling results from a meeting (for instance, agenda creation, alternative rating or voting, or meeting reports).

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On the other hand, conferencing software gives participants time to look up the information they need and to consider their input to the discussion at their own pace.

We examined four group conferencing packages for this review: Channels, Version 1.0a, from TEAM Software; Lotus Notes, Release 3.0, from Lotus Development Corp.; TeamSync, Version 1.33, from GlobalStream Corp.; and TeamTalk, Version 1.0, from Trax Softworks. All of these products use Windows as their front end and share similar interfaces and features. A fifth package, Collabra Share from Collabra Software, is due to ship in mid-1994; but no beta copy was available to us during our testing schedule. Early indications are that Collabra Share will be similar in features and functionality to the four packages reviewed here.

THE ROOTS OF CONFERENCING

There's one type of group conferencing software that's been around almost as long as PCs have existed: the electronic bulletin board system, or BBS. Many of the concepts used in today's conferencing packages were pioneered by BBS authors. BBSs were originally designed as a means for a single user at a time to log on, read the discussions, and leave messages. Today, they have evolved into multiuser systems that work over both LANs and modems and, in some cases, support hundreds of users simultaneously. Though these BBS packages are still restricted to using plain text or, at most, ASCII or ANSI graphics, they have one advantage over the conferencing packages we've reviewed: much better support for remote users. (See the sidebar "The Electronic Watercooler.")

Although they use their own names for particular functions, the four conferencing packages we reviewed do share Microsoft Windows functionality and a way to limit discussion access to a select group of users.

A single discussion is known as a thread, a term borrowed from the BBS world. Group conferencing packages use



• TeamTalk, Version 1.0

Trax Softworks' TeamTalk was the first of the four conferencing software packages we tested, and its strong collection of features quickly set the standard for the rest. Thus, it earns our Editors' Choice award.

We found TeamTalk very easy to set up and use and thought its interface quite intuitive. We liked the way it makes use of Microsoft Windows' capabilities and were particularly impressed with its graphics features and support for OLE. TeamTalk's method of displaying discussions as a continuous thread was much easier to follow than the alternate method of displaying one message at a time. TeamTalk is also the only package of the four that supports full search capabilities across discussions. TeamTalk's support for virtually any network operating system was the final factor in earning it our Editors' Choice.

GlobalStream Corp.'s TeamSync deserves an honorable mention. Like TeamTalk, TeamSync is quite simple

to set up and use and displays discussions as a continuous thread. TeamSync is the only one of the four products to include a spell-checker and to support real-time voting. It's a capable product if you don't need all the features TeamTalk provides.

Channels, from TEAM Software, has some interesting features that make it as much a groupware application as a conferencing package; but we found its messaging interface somewhat awkward to use.

Finally, Lotus Notes has conferencing features similar to TeamSync's, but the investment it demands is too great to consider it for conferencing alone. But if you already use Notes, and are seeking a conferencing tool, you probably need look no farther.

two basic methods to display message threads. Lotus Notes and Channels default to showing a thread as a hierarchical tree, with an on-screen indication of the root message and all responses to that message. In these products, users read messages by clicking on the message subject, which opens up a separate window containing the text.

TeamSync and TeamTalk, however, default to display a thread as a continuously scrolling transcript with each user's contribution indicated by a message header. They also offer the option of representing a thread as a hierarchy. We found it much easier to follow the threads when they're displayed as a transcript.

EMOTIONAL RESCUE

All these products offer ways to stress particular points in a message. The most

common emphasis in the on-line world is the emoticon—a text-based graphic that indicates humor, anger, or some other emotion. Two good examples are <g> and :-> (look at this one sideways), which stand for a grin and a smile, respectively. Only TeamTalk provides built-in graphic emoticons that can be included in messages. Lotus Notes and TeamSync let the user change the text's font or color or both for emphasis.

Although these packages are similar in nature, each boasts some unique features. TeamSync, for example, is the only one with a built-in spell-checker and the ability to handle real-time votes on the topic being discussed. Lotus Notes and Channels can be tied in to external e-mail systems to serve as a front end for both the discussions and the private mail. Channels also provides public and private to-do lists and "While You Were Out" messages. Both TeamSync and Channels support private user-to-user chat functions.

Of course, Notes provides many fea-

Our Contributors: JOE SALEMI is a contributing editor of *PC Magazine*.

LANCE ULANOFF was the associate editor in charge of this story, and JEFF MACE was the project leader.

tures (described in other reviews in this issue) besides conferencing and e-mail links. It's more of a groupware package with conferencing capabilities. The vendors of the conferencing packages like to point out that most organizations use Notes primarily for its conference features. These vendors market their products as reasonably priced alternatives to Notes' \$495-per-user cost.

Though they'll never entirely replace face-to-face meetings, group conferencing packages go a long way toward easing the burden of planning and conducting a meeting.

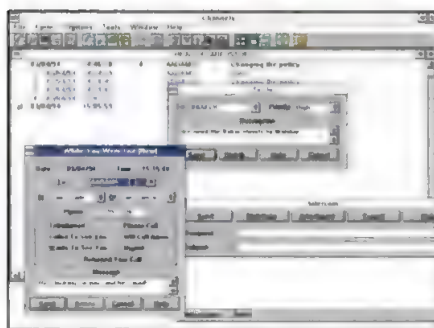
TEAM Software Inc.

● Channels, Version 1.0a

BY JOE SALEMI

The value of TEAM Software's Channels, Version 1.0a, lies in the simple pleasures it provides. Channels is a client/server application that stores conferences in a pre-configured database managed by the server module. Its front end isn't fancy, but Channels is an easy product to use and gets the job done. Channels costs \$54.90 per user and is sold in 10-, 20-, 50-, and 100-user packages; the 100-user package carries a 10 percent discount.

Installing Channels is fairly straightforward, though you must first set your LAN system parameters. The most important of these is a new log-on ID for the Channels Communication Server. The next step is to choose the workstation on which to install the Communication Server software and use as a dedicated server for the system; it needs to run Windows to support the Communication Server. You can enable Channels to support any vendor-independent messaging (VIM) or Microsoft API (MAPI) e-mail system during the workstation installation. The e-mail system then acts as a front end for the



Channels provides other groupware functions in addition to conferencing, such as While You Were Out messages, To-Do lists, and one-way, real-time user intercom messages.

user's mailbox. Channels comes with replication software that duplicates discussions across servers, but you need a VIM or MAPI e-mail system; the duplication server uses the mail system to transport messages from one Channels system to another.

As you'd expect, each discussion area is called a channel, and different channels are grouped together for easier maintenance. The product displays channel messages in a hierarchical list, with the starting message's title shown in bold or a

different color. Messages appear in a separate window when you click on the title. We found replying to messages somewhat annoying because Channels doesn't automatically pick up the subject from the original message.

Channels has a few features not found in other products reviewed here, including the ability for a user to post While You Were Out messages for other users.

Channels is a good conferencing package at a reasonable price, with a number of groupware features that prove handy in many office situations. As with Lotus

SUITABILITY TO TASK

	Channels	
	Power	Ease of Use
Administration	GOOD	FAIR
Conferencing	GOOD	GOOD
Application integration	GOOD	GOOD

Notes, though, you should be prepared to dedicate a workstation to the server portion and to run additional NetBIOS or TCP/IP drivers if neither is used as the LAN's native protocol.

► **Channels, Version 1.0a.** List price: 10-

Suitability to Task: Conferencing Software

The market for Windows-based conferencing software is relatively new, and there are few, if any, standards by which to judge the existing products. All four products in this review provide the basic conferencing functions that let users read and respond to messages at their leisure. How they present those functions, and the additional features they provide beyond basic conferencing, can vary significantly from one product to the other.

In order to give you a reference point, we've rated these conferencing packages on three rather general tasks. We base our scores on whether a product is poor, fair, good, or excellent in two categories: power, which measures a product's depth of features, and ease

Administration includes functions such as setting up the package, adding and maintaining user IDs, and preparing conference sessions. To score a rating of excellent, a package

must provide complete support for managing conferences; this includes creating conferences, assigning user security, and managing conference messages.

The **conferencing** rating reflects our impressions of the overall user interface and the additional features the package provides beyond basic conferencing. In rating these packages, we look at how easy it is to join a discussion and read and reply to messages in it. We also consider the depth of offerings a package provides in this area. Products that score the highest ratings in this category include additional features, such as real-time chats, the ability to emphasize points in a message, and an on-line to-do database.

SUITABILITY TO TASK

	Company Name	
	Power	Ease of Use
Administration	EXCELLENT	POOR
Conferencing	GOOD	FAIR
Application integration	FAIR	GOOD

Application integration measures each package's ability to connect with outside e-mail packages and its ability to add external files to a message. For a package to earn a high rating, it must provide total integration with

one or more external e-mail systems, allowing users to replace their existing e-mail front end with the conference software. We also look at a product's ability to connect to other applications via DDE and, in some cases, OLE. Packages with support for remote users also score well in this category.

The Electronic Watercooler: *The Bulletin Board System*

By Joe Salemi

PC users were exchanging messages and files long before the concept of the "information highway" caught the attention of the general public. The first electronic bulletin board systems, or BBSs, appeared in the late 1970s and quickly became popular with the micro-computer pioneers. The early BBSs let a single user at a time dial in, read, and contribute to ongoing discussions in a single message base.

Today's BBS software has come a long way from those humble beginnings. Virtually all BBS packages provide multiple message bases and file areas, which allow the system operator, or sysop, to separate discussions by topic. The top BBS packages also support multiple users logging on simultaneously, via either a remote modem or a LAN. It's the latter capability that makes a BBS package a viable alternative to the conferencing software covered in the main reviews.

Using a BBS for group conferencing has both advantages and disadvantages. The most significant benefit is its native support for remote users. Unlike conferencing software, a BBS is designed for dial-in use. Also, the vast majority of BBS packages run on DOS, so you don't have to convert all your users to Windows if you haven't already done so.

On the other hand, dial-in support means that the BBS has to work with a wide variety of terminal programs, so graphics are limited to ASCII text. The Remote Imaging Protocol (RIP), a new type of BBS graphic that has recently become available, provides a more graphical interface for BBS users. Unfortunately, RIP doesn't work across a LAN, so you're limited to ASCII text for internal use.

Dozens of BBS packages are avail-

able, whether commercially, as shareware, or for a minimal download charge. We cover just a few of the more popular packages that provide both dial-in and LAN support. All of these packages allow private e-mail between users, along with private and public message areas for ongoing discussions. They also let remote users upload and download files, as well as attachments, to specific users; you can use this capability to make supporting documents available to the members of a conference.

THE MAJOR BBS, VERSION 6.2

Galacticomm's The Major BBS, Version 6.2, is primarily designed to support multiple users. It takes advantage of its multitasking capabilities on 80386 and higher machines with a minimum of 4MB of RAM to support up to 256 simultaneous users. The Major BBS supports a number of multiport serial cards; Galacticomm also sells the eight-serial port GalactiBoard for \$495 and the GalactiBox for \$1,495, an external AT-size expansion chassis that supports up to 16 internal modems or serial boards. The base two-node package costs \$259; each additional six-node package costs \$249.

The standard Major BBS package supports LAN log-ons, but each LAN channel replaces a dial-in port and is tied to a specific network node. Unfortunately, this requires a user license for each workstation on your

LAN, even if the users aren't always logged on to the system. Galacticomm also sells the Advanced LAN Option for \$645, which provides virtual log-on channels across a NetWare LAN.

One of The Major BBS's biggest

strengths is its extensibility. Galacticomm offers a number of add-on options that provide features such as a built-in database, on-line faxing, and text retrieval. A number of third-party add-ons, such as the \$249 Major Gateway/Internet, are also available to sup-



Wildcat!'s configuration utility gives you extensive control over a conference area. You can specify, among other options, whether an area has special menus, bulletin, and its own sysop.

port a wide variety of business needs.

► The Major BBS, Version 6.2.

Galacticomm Inc., 4101 SW 47th Ave., Suite 101, Fort Lauderdale, FL 33314; 800-328-1128, 305-583-5990; fax, 305-583-7846.

Circle 479 on reader service card.

PCBOARD, VERSION 15.1

Clark Development Co.'s PCBoard was our Editors' Choice in the September 10, 1991, review of BBS packages. Version 15.1 adds a number of new features, including the PCBoard Programming Language (PPL), which lets the sysop design complex scripts to customize the software's capabilities. However, you'll need the PPL Compiler to use PPL. The base package includes support for both LAN log-ons and multiple nodes on the same machine. Multiple nodes require additional multitasking software, such as Microsoft Windows, DesqView, or OS/2. You can

run up to four nodes on a 386 or better machine with the standard COM ports and up to 16 nodes with an intelligent serial board.

PCBoard supports up to 32,767 different nodes and up to 65,535 different conference areas. It comes in a number of user configurations, ranging from a 2-node version to a 1,000-or-more-node version. The 2-node version costs \$150, the 5-node version \$250, the 10-node version \$350, and the 25-node version \$550. 50-, 100-, 250-, and 1,000-node versions are available at commensurate price discounts. The PPL Compiler costs \$50 if purchased with the 2-, 5-, or 10-node versions and is free with versions of 25 or more nodes.

► **PCBoard, Version 15.1.** Clark Development Company Inc., 3950 South 700 East, Suite 303, Murray, UT 84107-2173; 800-356-1686, 801-261-1686; fax, 801-261-8987.

Circle 480 on reader service card

REMOTE ACCESS PROFESSIONAL, VERSION 2.01

Prima Facie Distribution split Remote Access into two products when it released Version 2.0. The shareware version, released by WanTree Development, supports only 2 nodes,

costs \$50 to register, and is available for downloading from a number of on-line services. The commercial version, called Remote Access Professional, adds additional features and is available in 2-, 10-, and 250-node versions. The 2-node version costs \$149, the 10-node version \$269, and the 250-node

version \$529. Multiple nodes can be run on the same system either under multitasking software such as DesqView or Windows or across any LAN that supports DOS SHARE-type file locking

calls. Additional LAN functionality is provided if the network supports NetBIOS.

The majority of business organizations will prefer the professional version to the shareware, particularly for Remote Access Pro's real-time conferencing capabilities. A real-time conference is a multiuser chat area that can be permanent or temporary, public or private. Up to 125 separate real-time conferences can be in operation simultaneously. Depending on the message storage format chosen, Remote Access Pro supports either 200 or an unlimited number of discussion areas.

► **Remote Access Professional, Version 2.01.** Prima Facie Distribution Inc., 108 W. 3rd St., Bonner Springs, KS 66012; 800-648-9800, 913-441-1336; fax, 913-441-0596.

Circle 481 on reader service card

SEARCHLIGHT, VERSION 3.5

Searchlight Software's Searchlight, Version 3.5, remains one of the easiest BBS packages to set up and use; it is also one of the least expensive. Searchlight features built-in support for running multiple nodes over a LAN or on a multitasking system. Multitasking systems support up to four ports on a stan-

dard 286 or better (though the company recommends only one node for a 286) and up to 10 nodes with any intelligent serial board. Searchlight packages cost \$99 for 1-node, \$179 for 3 nodes, \$299 for 10 nodes, and \$399 for unlimited node support.

Version 3.5 supplies a private mailbox for each

user and an unlimited number of public and private message areas. Version 4.0, which should be available by the time you read this, will add direct support for using Searchlight as an

Internet node. The only additional software needed will be a utility to move Internet mail on and off the BBS; Searchlight Software provides this at an additional cost.

► **Searchlight, Version 3.5.** Searchlight Software Inc., 6516 Detroit Ave., Cleveland, OH 44102; 800-988-5483, 216-631-9290; fax, 216-631-9289.

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WILDCAT! 3.9

In the late 1980s, Mustang Software released BrainStorm!, one of the first LAN-based conferencing software packages. BrainStorm! never caught on, but Mustang used the technology developed for it to improve the LAN support in its Wildcat! BBS software. Today, Mustang concentrates on communications software. In addition to Wildcat!, the company also sells the QmodemPro for DOS and QmodemPro for Windows communications packages.

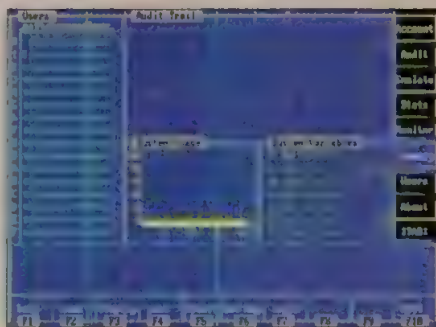
Wildcat!, Version 3.9, comes in a single-node version for \$129 and a 10-node version for \$249. The 250-node version, called Wildcat! Professional, costs \$499. A version that supports up to eight nodes on the same system using an intelligent serial port board sells for \$799.

Wildcat! is known for its ability to exchange e-mail with external mail systems that use Novell's MHS through its wcMHS Gateway (\$299). You can send private messages from the BBS to MHS, and from there to other e-mail users or any of the MHS gateways. The wcUUCP Gateway, priced at \$299, links Wildcat! to the Internet.

One feature unique to Wildcat! is its Autonode support. Instead of requiring LAN users to log on to the same BBS node, the Autonode feature checks for the next available node and automatically assigns it to the user. □

► **Wildcat!, Version 3.9.** Mustang Software Inc., P.O. Box 2264, Bakersfield, CA 93303; 800-999-9619, 805-873-2500; fax, 805-873-2599.

Circle 483 on reader service card



The Major BBS's main screen gives the sysop several ways to monitor the system. You can see which ports are in use and which are idle, monitor system activity and usage, and examine users' activities while they're on-line.



Dynamic-STN color: Designed with greater contrast and improved color saturation, Toshiba's dual-scan display is noticeably pure and vibrant.

Rugged Design:
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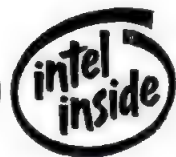


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user, 20-user, or 50-user package, \$54.90 per user; 100-user package, \$49.41 per user. Requires: For file server: 40MB hard disk space, NetBIOS or TCP/IP protocol; for communications server: 386/33 or better, 4MB RAM, 2MB hard disk space, Microsoft Windows 3.1; for each workstation: 386/16 or better, 4MB RAM, 1MB hard disk space, Microsoft Windows for Workgroups 3.1. TEAM Software Inc., 5858 Westheimer St., Houston, TX 77057-0759; 800-785-1112, 713-784-4480; fax, 713-784-4498.

Circle 475 on reader service card

Lotus Development Corp.

● Lotus Notes, Version 3.0

BY JOE SALEMI

One of Lotus Notes' many functions is its ability to create group conferences, which it refers to as "discussions." Its conferencing capabilities are built around a standard Lotus Notes database and are equivalent to those found in TeamTalk and TeamSync. Group discussions are easy to set up, manage, and use.

But unless you're already using Lotus Notes for other purposes, you'll find that one of the other three packages reviewed here can do the job just as well at a lower price and without the complexities involved in setting it up. The Lotus Notes server (which allows one user) costs \$495;

SUITABILITY TO TASK

	Lotus Notes	
	Power	Ease of Use
Administration	GOOD	FAIR
Conferencing	EXCELLENT	GOOD
Application integration	FAIR	GOOD

additional client packages are available for \$495 per user.

Lotus Notes uses its standard databases for creating and managing group discussions. Once the database is created, authorized users can add it to their own Notes folders. Because discussions are actually Lotus Notes databases, they can be accessed remotely via a modem or a WAN, using Lotus Notes' built-in remote capabilities. Discussions can also be shared across different servers, using Notes' replication capabilities. The person who creates the discussion automatically becomes its moderator; moderators have full access rights

By Joe Salemi

If you check the applications you're using on your LAN, you may find that you already have a BBS. The most likely suspects are your e-mail and groupware packages. The best example of this is Lotus Notes, which we review separately. There are three e-mail packages that

provide BBS capabilities, as well: Lotus cc:Mail for Windows, Release 2.0; DaVinci eMail for DOS and Windows, Version 2.5; and WordPerfect Office, Version 4.0. Our recent review of these packages ("The E-Mail Personae," April 12, 1994)

touches briefly on their built-in BBS capabilities and includes contact and pricing information. In addition to those three packages, Microsoft Mail can feature conferencing capabilities with the use of CTRG's Townhall for Windows, Version 1.1.

CC:MAIL

Lotus Development Corp.'s cc:Mail, Version 2.0, provides public BBS features through one or more public BBS mail folders. E-mail users with proper access can read and post messages in the BBS folders as if they were regular mail messages. Each folder constitutes a topic or thread of information. The system administrator can set the folder's security so that messages are stored as read-only files. The system administrator or message originator are the only ones who can delete messages in a read-only folder.

DAVINCI EMAIL

The BBS in DaVinci System Corp.'s DaVinci eMail for DOS and

Windows, Version 2.5, must be turned on by the system administrator. Once it's on, users find a BBS submenu added to their default DaVinci menu. DaVinci's BBS is actually a built-in e-mail gateway: Users post messages on the BBS by addressing them to "[BBS]@<mail server>." Discussion

topics are governed by the subject of the original message, and the BBS can be set so that any user or only the system administrator can start a new topic. DaVinci's built-in support for combining messages with the same subject into threads makes it

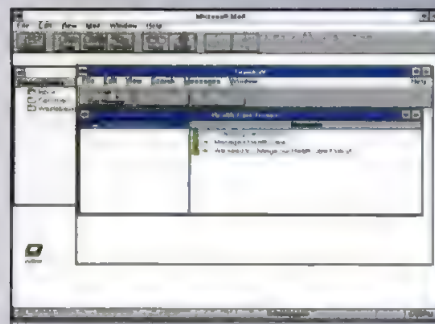
easy to move up and down through BBS messages.

WORDPERFECT OFFICE

WordPerfect Corp.'s WordPerfect Office, Version 4.0, doesn't include a BBS per se, but its Proxy capability provides BBS-like functions. Proxy groups users together for common access to schedule and task lists and to a common mailbox. The common mailbox can then be used for discussions since all users in the Proxy group can read and write to it.

TOWNHALL FOR WINDOWS

Microsoft Corp.'s Microsoft Mail for PC Networks doesn't include its own BBS functions, but you can add them in with CTRG's Townhall for Windows, Version 1.1. Townhall requires that you already have Microsoft Mail 3.x installed and costs \$1,495 per Microsoft Mail server. It requires 2MB of hard disk space on the server; the client portion requires at least a 286 (386 or



Townhall for Windows is a Microsoft Mail add-on that provides conferencing capabilities. Its interface is identical to Mail's, so it won't take long for users to learn the software.

higher recommended) with 3MB of RAM, 2MB of hard disk space, and Microsoft Windows 3.1.

Townhall links tightly with Microsoft Mail and uses the Microsoft Mail user directory for its own user IDs. It also adds itself as a new menu item to the Microsoft Mail client software. It's fairly simple to install, though we did find that you have to make sure the MSMAIL.INI file points to a valid mail server. The Townhall manual gives complete details on what has to be in MSMAIL.INI and TOWNHALL.INI.

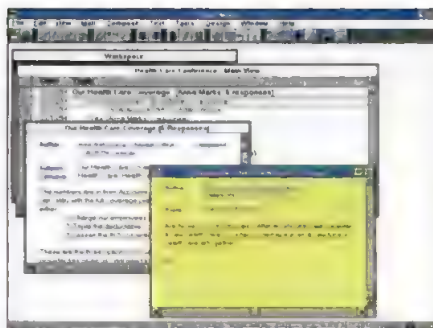
If you run Townhall directly, it loads the Microsoft Mail spooler and asks for your mail log-on ID and password. If you run it from inside Microsoft Mail, it loads without stopping for a log-on. Either way, Townhall's screens closely resemble Microsoft Mail's. It stores the conference messages in folders and uses the same interface for reading and responding to the messages.

The e-mail administrator is the only one who can create new bulletin boards, though another user can be assigned moderator once a board is created. Access to a particular board can either be public or limited for both read and write capabilities. Townhall also automates board management by letting you set expiration dates for the whole board or for messages in the board.

Finally, Townhall includes Replication Server software, which replicates a particular board between multiple Microsoft Mail servers. The Replication Server lets you create enterprise-wide bulletin boards and ensures that they're all kept current with the latest messages. The Replication Server software runs under DOS and requires a dedicated system if you want it to run all the time. □

► **Townhall for Windows, Version 1.1.** CTRG Inc., 2218 Gibsonwoods Ctr. NW, Salem, OR 97304; 503-391-4468; fax, 503-391-6272.

Circle 484 on reader service card



Lotus Notes displays discussion subjects hierarchically, with the original message shown on a white background and replies on a yellow background.

and can set up a range of rights for other users of the database.

Lotus Notes defaults to a hierarchical display, with the starting message's subject shown in bold text at the left margin and responses indented below it. Because discussions are based on a Notes template, you can alter the appearance of the conference to suit your style and needs.

Users can read messages by clicking on the subject.

The Compose menu gives users the option of starting a new message thread, responding to the main message, or responding to a reply. Though Lotus Notes doesn't provide premade graphic emoticons, users can type in their own or change the color and font of text for emphasis.

We found Lotus Development Corp.'s Lotus Notes to be an ideal though somewhat expensive platform for running group conferences. Lotus Notes makes it easy to set up and use a discussion area—if you're already using Lotus Notes for other purposes, that is. If you do already use Lotus Notes or are considering it for its other functions, you should certainly look into using its conferencing abilities. If you're just looking for a conferencing package, however, you'll probably be better off with one of the other packages covered in this set of reviews.

► **Lotus Notes, Version 3.0.** List price: \$495 per user (10 users maximum). Requires: For file server: 386 or better; 12MB RAM; 60MB hard disk space; OS/2 1.3, NetWare

2.2, or Microsoft Windows 3.1. For each workstation: 4MB RAM, 40MB hard disk space, DOS 3.1, Microsoft Windows 3.x. Lotus Development Corp., 55 Cambridge Pkwy., Cambridge, MA 02142-1295; 800-343-5414, 617-577-8500.

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GlobalStream Corp.

● TeamSync, Version 1.33

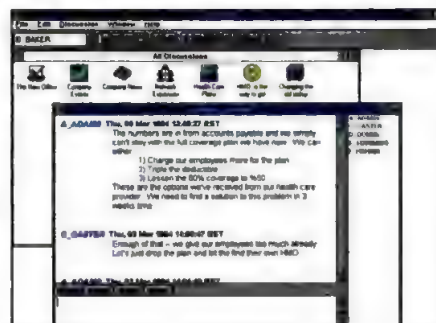
BY JOE SALEMI

GlobalStream Corp.'s TeamSync, Version 1.33, is the least expensive of the four conferencing packages we reviewed, but don't let that fool you: This is a solid conferencing program. TeamSync is a good choice for group conferencing if you don't need the depth of features offered by TeamTalk. TeamSync is priced at \$99 for a 5-user package, \$179 for a 10-user package, and \$349 for a 25-user package.

TeamSync's interface makes it easy to create and participate in discussions. The first person to log on to TeamSync becomes the default administrator, who has the authority to add additional users and set default rights for new users. The product supports adding bitmaps to user records, so if you have your picture scanned in you can have it appear with your conversations.

TeamSync's message interface is similar to TeamTalk's: Every message in a transcript is displayed in a scrolling window with a reply box at the bottom. Users can view a transcript either in a hierarchical tree that shows the root message and

	SUITABILITY TO TASK	
	TeamSync	
	Power	Ease of Use
Administration	GOOD	GOOD
Conferencing	GOOD	GOOD
Application integration	FAIR	GOOD



TeamSync's interface lets users scroll through the entire transcript of a discussion, spell-check their replies, and monitor other users currently on the system.

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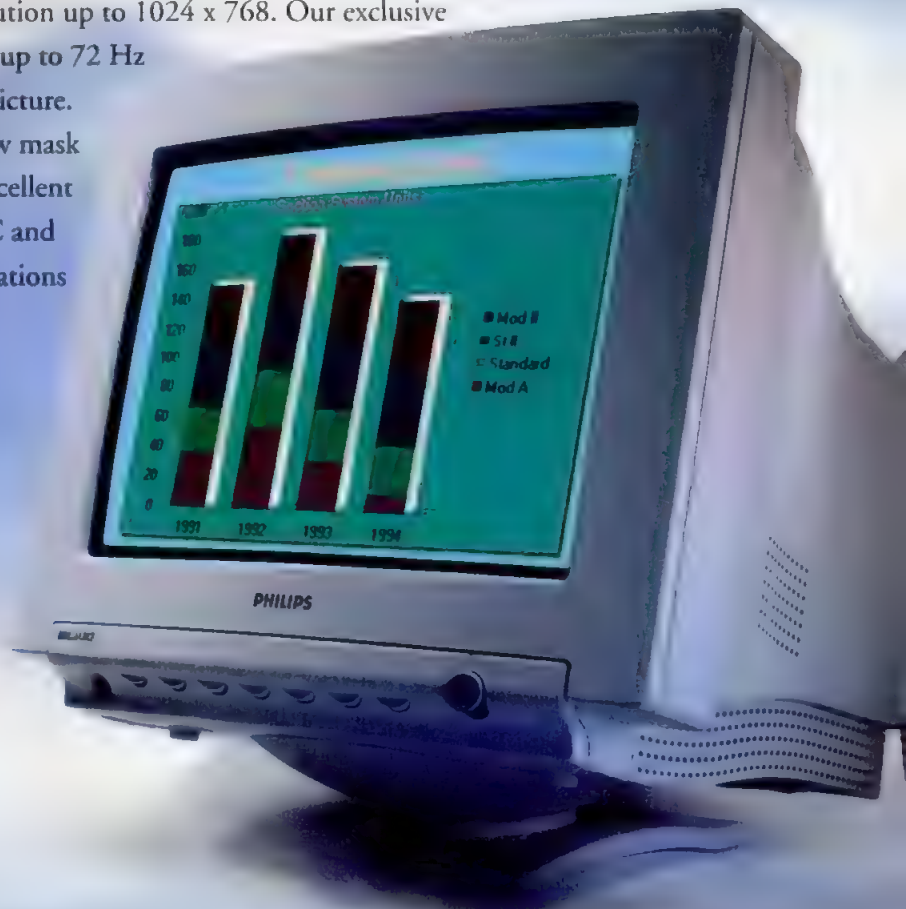
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all replies by subject, or in a condensed view that shows only the subject, date, and creator of the message.

TeamSync offers a couple of other features that should please most users. It is the only product we reviewed, for example, with a built-in spell-checker that checks messages before they're added to the transcript. TeamSync also supports anonymous messages.

Another unique feature is TeamSync's real-time voting capabilities, a feature typically found in sophisticated electronic meeting systems. (See "Meeting Makeovers.") Any member of a discussion can initiate a vote by creating a ballot via a dialog box. The ballot can be sent to one or more users and set by its creator to expire in a given amount of time. The biggest drawback to TeamSync's voting capabilities is that it only applies to users who are logged on; votes can't be stored and accessed by users who aren't on the system. Remote user support and ties to an e-mail system are under development and may be available by the time you're reading this, along with support for OLE 2.0, DDE, replication/synchronization, remote dial-in access, and support for 500 users per server.

TeamSync is a strong conferencing product at a reasonable price. If you don't need the wealth of features that a product such as TeamTalk provides, you'll find TeamSync to be a good investment.

► **TeamSync, Version 1.33.** List Price: 5-user package, \$99; 10-user package, \$179; 25-user package, \$349; 50-user package, \$599. Requires: For file server: 3MB hard disk space, NetWare IPX or a NetBIOS-compatible network; for each workstation: 386SX/20 or better, 4MB RAM, 1KB hard disk space, DOS 5.0, Enhanced Mode Microsoft Windows. GlobalStream Corp., 5122 Olympic Drive, NW, Suite A-102, Gig Harbor, WA 98335; 206-858-7858.

Circle 477 on reader service card

Trax Softworks Inc.

EDITORS' CHOICE
TeamTalk, Version 1.0

BY JOE SALEMI

Trax Softworks' TeamTalk, Version 1.0, is the most intuitive conference package of the four products in this review. Its

default interface makes it easy to participate in existing discussions or start a new one, and it supports the widest range of network operating systems. But its capabilities come at a price: TeamTalk costs \$395 for a 5-user package, \$1,775 for a 25-user package, and \$3,450 for a 50-user package.

One of TeamTalk's greatest assets is that it runs on any network that supports

DOS SHARE-type file locking, including most peer-to-peer LANs. Also, TeamTalk fully supports OLE 2.0, and any message or comments in a conference topic can include an OLE object. Furthermore, TeamTalk is the only product in this review that lets users search for a word or phrase across all of the topics they have access to.

Users can run TeamTalk in Autologin

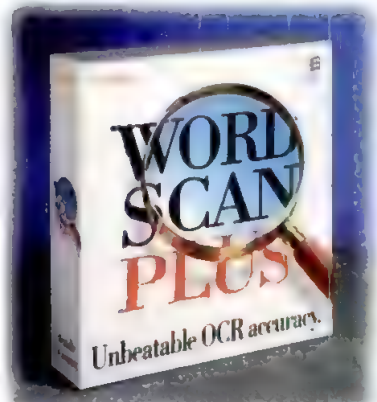
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mode (where it uses the network's security system), or they can assign themselves a password which triggers the TeamTalk log-on screen. The user who starts a new discussion automatically becomes the moderator, who can assign access rights and allow anonymous messages. TeamTalk also boasts a Supervisor function, used primarily to maintain discussions that no longer have a moderator and to rebuild the database indexes.

All comments appear in a continuous, scrolling screen. TeamTalk adds new comments to the end of the thread, and anyone reading the topic has immediate access to the new comment. If a topic member isn't reading a particular thread, the topic's icon flashes to alert the user that new comments have been added. When a user enters TeamTalk, an "updated" message appears in the title of any topic that has

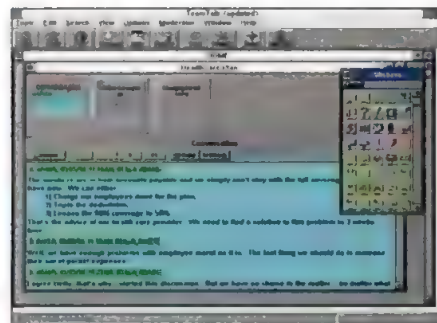
had new comments added since the last time the user was in the system. Premade emoticons (also known as Stickers) can also be dragged and dropped into any message from a pop-up window.

TeamTalk's interface makes it simple to participate in group conferences and keep track of the conversation threads. The only thing lacking from the version we reviewed was support for various e-mail systems; that was scheduled to be included in Version 1.0a, which should be available by the time you read this story.

It's an expensive product, but Trax Softworks' TeamTalk's support for OLE 2.0 and virtually every LAN operating system

makes it one of the best group conference applications available. □

► **TeamTalk, Version 1.0.** List price: 5-user pack, \$395; 25-user pack, \$1,775; 50-user pack, \$3,450; 100-user pack, \$6,700; 250-user pack, \$16,250; 500-user pack,

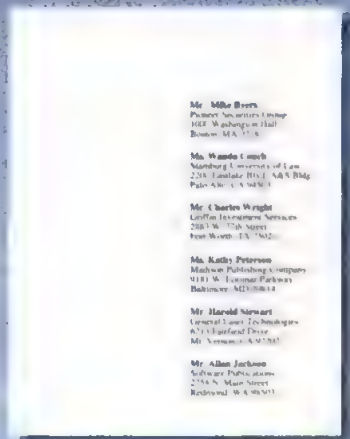


TeamTalk displays a topic's comments in a continuous scrolling window. Users can add graphic emoticons to their comments for emphasis and use OLE 2.0 to embed objects in the comments.

\$31,500; 1,000-user pack, \$61,000. Requires: File server: 4MB hard disk space, any network operating system that supports DOS SHARE-type file locking; for each workstation: 286, 2MB RAM, DOS 3.1 or better, Windows 3.1. Trax Softworks Inc., 5840 Uplander Way, Culver City, CA 90230-6620; 800-367-8729, 310-649-5800; fax, 310-649-6200.

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WANT NOT.



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Ms. Wanda Couch
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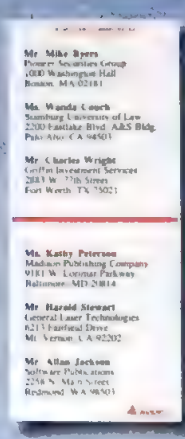
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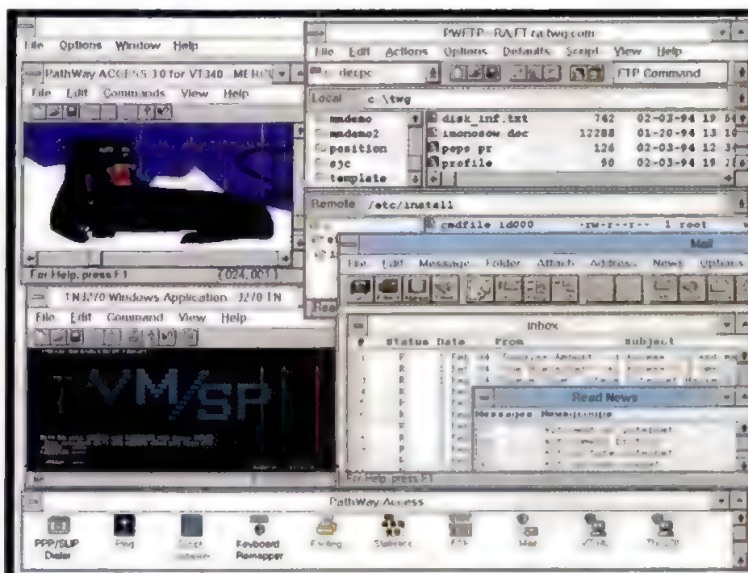
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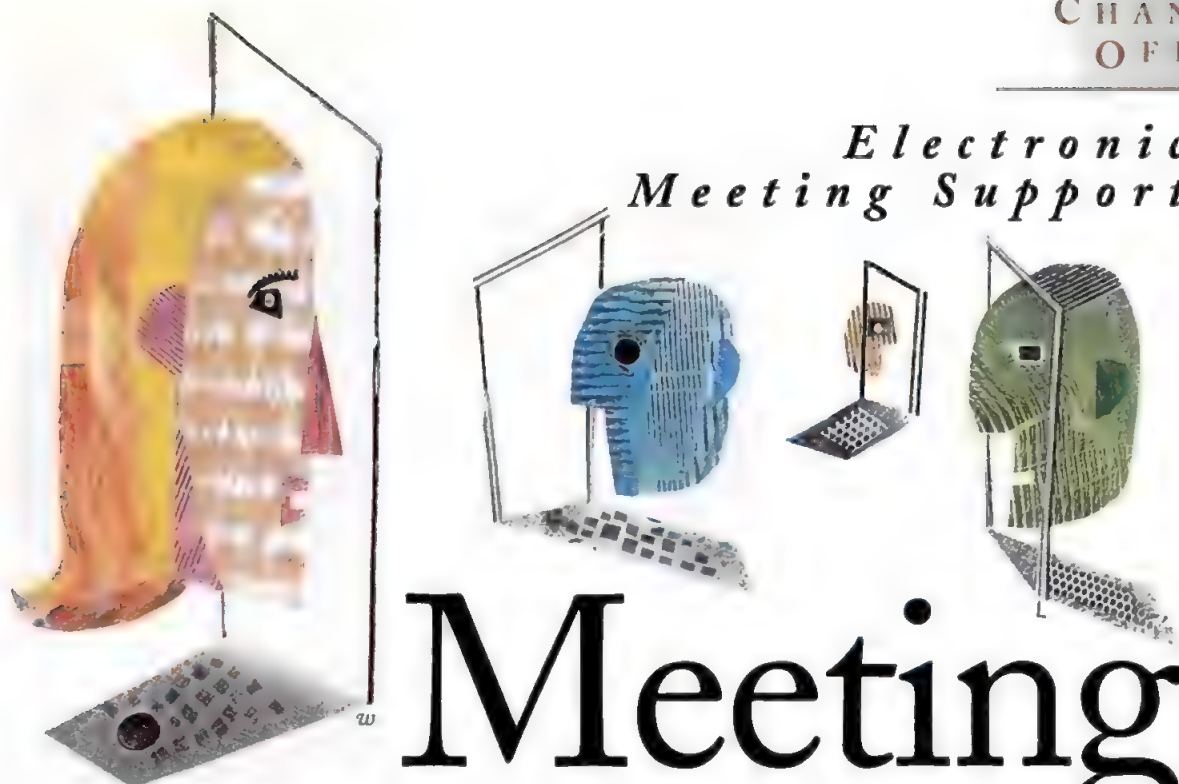
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*Electronic
Meeting Support*



Meeting Makeovers

While electronic meeting support software cannot guarantee that you will have better meetings, the potential is definitely there.

By Mary Ellen Kranz and Valerie I. Sessa

Denizens of the corporate world often gather around the water cooler to carp over the number of needless and ineffective meetings they must attend. But is it the concept of a meeting that's at fault, or is it the way meetings are run? Electronic meeting support software lays the blame squarely on the process. Though technology cannot replace human interaction, it can speed processes that would ordinarily take place in meetings, leaving more time for crucial discussions and consensus building.

The electronic meeting packages in this roundup—GroupSystems V, Version 1.1, from Ventana Corp.; VisionQuest for DOS, Version 2.2, and VisionQuest for Windows, Version 2.28 from Collaborative Technologies Corp.; and The Meeting Room, Version 1.1,

from Eden Systems Corp.—address these issues. MeetingWorks for Windows, Version 2.1a, from Enterprise Solutions was in late beta stage at the time of our testing (see the sidebar “MeetingWorks for Windows” for a description).

Emphasis on venue, that is, either face-to face or across a LAN, distinguishes the three products we test-

ed. The Meeting Room is designed for people who rarely meet in person and would rather conduct their meetings over a network. On the other hand, GroupSystems V and VisionQuest, perhaps because they're veterans of the marketplace, operate with equal comfort in both networked and face-to-face meetings. This approach

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allows some collaborative work to take place at the desktop and then carry over into the meeting room when it seems more appropriate to meet face-to-face.

THE MEETING TREADMILL

In the traditional scenario, meetings are often regarded with trepidation and are considered time-consuming, unproductive, and ineffective. Meetings can be dominated by a few verbose individuals, while more reserved group members are unable or unwilling to voice their ideas and information. Often, by the end of a meeting, no one is exactly sure what was decided or what he or she is supposed to do next.

Workgroups need mechanisms that foster successful collaboration and unite the expertise of the group members. They also need tools to help generate, consolidate, evaluate, and document their ideas and information. Finally, most businesses continue to depend on face-to-face interaction, but problems of time, pressure, and geographic location are bringing about new and innovative ways to conduct meetings, allowing workgroups to interact regardless of time or location constraints.

In the new scenario, group leaders carefully plan the agenda and map out the meeting on a PC. Participants use PCs during the course of the meeting to generate ideas about the topic being discussed, consolidate those ideas into a set of manageable alternatives, and poll the group to see where its members stand at any given time on the issues. Input is immediately displayed for all to see. And because the input can be anonymous, meeting participants focus on the message, not the messenger.

These meetings still have a leader, now referred to as *facilitator* (sometimes called a *coordinator*) who is familiar with the system and implements the appropriate



● GroupSystems V, Version 1.1

The electronic meeting support software category may seem like a new one, but in truth it's been around for at least half a decade, and Ventana Corp. was there from the beginning. The company all but wrote the book on electronic meeting support (actually,

company CEO Jay Nunamaker, Ph.D., a recognized expert on group support software, has written extensively on the subject). So it comes as little surprise that its product, GroupSystems V, has the richest set of tools for running same-time, same-place, electronically enhanced meetings, as well as equally strong support for meetings held across a network and those held at different places and different times. The product even helps

facilitators design the meeting by suggesting the appropriate tool for a selected topic. As such, it earns our Editors' Choice. With the expected addition of a Microsoft Windows product, Ventana should complete its electronic meeting support picture.

In some areas, the other two electronic meeting support products we reviewed, Eden Systems Corp.'s The Meeting Room and Collaborative

electronic meeting tool for the task at hand. Ideally, the facilitator is someone skilled in group processes, with or without technology.

The physical scenario for software-supported meetings ranges from *same-time, same-place*, in which meetings are held in specially equipped rooms, to *different-time, different-place*, in which meetings are held wherever the participants are working or whenever they can participate. Typically, participant PCs are connected to a LAN running the meeting software. For our purposes, our tests focused primarily on same-time, same place meetings.

THE TOOLS

GroupSystems V, The Meeting Room, and VisionQuest each contain a suite of meeting support tools. Among these are tools that support meeting design, agenda creation, and process facilitation; idea-processing tools such as idea generation,

idea consolidation, alternative evaluation, and voting; and meeting reports.

Most of the companies that have developed electronic meeting support software believe that the ingredients for successful meetings go beyond simply loading their software onto a network. Both Ventana and Collaborative Technologies stress training as a key ingredient in the successful implementation of their product. Each company offers two- or three-day training courses, which include instructions on both the technical and group-process skills needed to conduct

Suitability to Task:

Electronic Meeting Support Software

The three electronic meeting support packages in this roundup are designed to provide workgroups with computer-driven aids to facilitate meeting processes. We rated the power and ease of use of each of these products based on the three tasks most important for a same-time, same-place meeting scenario.

To receive an excellent power rating on our **meeting creation** task, a package must allow the meeting facilitator to configure the entire meeting ahead of time. In addition, the facilitator should be able to make real-time changes to the meeting (for

Our Contributors: MARY ELLEN KRANZ is an internal consultant for training technologies and VALERIE I. SESSA is a research associate at the Center for Creative Leadership, a nonprofit research and training organization located in Greensboro, North Carolina. Kranz, who studies technology and its applications in education, has over 25 years of experience in information systems management and has taught in public and corporate settings. Sessa researches and writes on workforce diversity, team effectiveness, and executive selection. LANCE ULANOFF was the associate editor in charge of this story, and JEFF MACE was the project leader.

Electronic Meeting Support

dors offer varying price structures that can be customized to individual situations.

THE PAYOFF

Electronic meeting support software can have a dramatic effect on a meeting's results. Beyond saving time and increasing participation, software-supported meetings have other important advantages over traditional meetings. They are better-planned and stay on task because an agenda is an integral part of the electronic process; they create a wider range of alternatives for consideration; they provide the ability for the group to measure and move toward consensus and commitment at all times; they produce a stronger commitment to solutions; and they create meetings that are fully documented with computer-generated printouts available during and immediately after the meeting.

Uses for electronic meeting software are as varied and creative as the organizations that employ them: Strategic planning, total quality management facilitation, and community planning are but a few. But the bottom line is that well-executed, software-supported meetings enhance the efficiency and productivity of groups. The technology is essentially transparent, and the focus is on the group process and movement toward its goal.

Remember, electronic meeting support software is no substitute for effective leadership in directing group work. However the tools it provides, such as

Technologies Corp.'s VisionQuest for DOS and Windows, were on equal footing with GroupSystems V. However, neither of their toolsets was quite as broad and powerful as that of Ventana's product.

On the other hand, both products offer something that, at press time, Ventana was still working on: cross-platform functionality. In either The Meeting Room or VisionQuest, users can choose to participate in the same meeting from either the DOS or Windows client. That, in combination with some nice features geared specifically toward networked meetings in The Meeting Room and the more-affordable price of VisionQuest (compared with GroupSystems V), earn each product an honorable mention.

effective technology-supported meetings. Eden Systems, however, takes a different approach: The company believes that users can effectively learn its software via an on-line tutorial.

The impact this software can bring about makes it worth investigating electronic meeting support software. Site visits, trial meetings within your company, or attending one of the growing number of "group decision rooms" located throughout the country are good ways to test the efficiency and receptiveness of the software within your organization. Some ven-

example, if a participant leaves the meeting early). The product must provide capabilities for easily running a meeting and making changes to that meeting. We also rate how much work the facilitator must do

SUITABILITY TO TASK

Company Name	Power	
	Power	Ease of Use
Meeting creation	POOR	EXCELLENT
Idea processing	FAIR	GOOD
Meeting reports	GOOD	FAIR

on the computer to move the team from one agenda item to another during the meeting.

Several issues are involved in rating each package for its usefulness in **idea processing**. A product that scores well for power on this task should

provide a strong suite of tools, while at the same time remain a transparent tool in the actual meeting. A high rating here means that the package provides idea-generation, -consolidation, and -evaluation tools, as well as survey capabilities. Also included in this score is the overall satisfaction of the meeting participants. Ease of use in this area is measured by how easily users can participate and add information to the meeting.

Electronic meeting support software that provides clear and attractive meeting reports scores well for power on our **meeting reports** task. To receive an excellent rating, the package must provide printouts of the agenda and details of each of the tasks in an easy-to-read, high-quality format. How simple it is to output comprehensive reports figures largely into the ease of use section of this rating.

idea consolidation, agenda creation, and alternative ranking all help to optimize, organize, and even formalize the processes that most groups *already* use in meetings. The gains can be well worth the effort.

Ventana Corp.

EDITORS' CHOICE
GroupSystems V

BY MARY ELLEN KRANZ

Ventana Corp.'s considerable experience in the research, development, and support of electronic meeting support software is evident in GroupSystems V, Version 1.1. Its 14 tools can be combined in endless ways to address a variety of meeting scenarios, while the simplicity of the user interface keeps the focus on the meeting objectives, not the technology. Whether you're conducting face-to-face or distributed meetings, you'll find GroupSystems V to be a solid electronic meeting software package.

The tools provided in this DOS-based program to set up and conduct meetings are easy to use, and their consistency and flexibility allow both new and experienced meeting facilitators to design and lead productive meetings with ease. Though the \$24,900 price tag for the basic package seems high at first, one meeting using GroupSystems V leads to the realization that this is a product you can apply to any number of group settings within an organization. The price also includes six seats in Ventana's two-day training program.

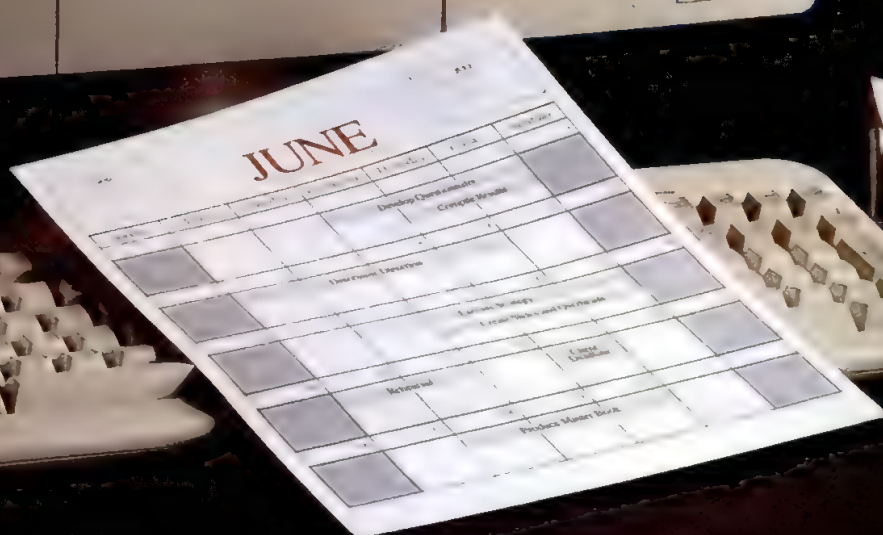
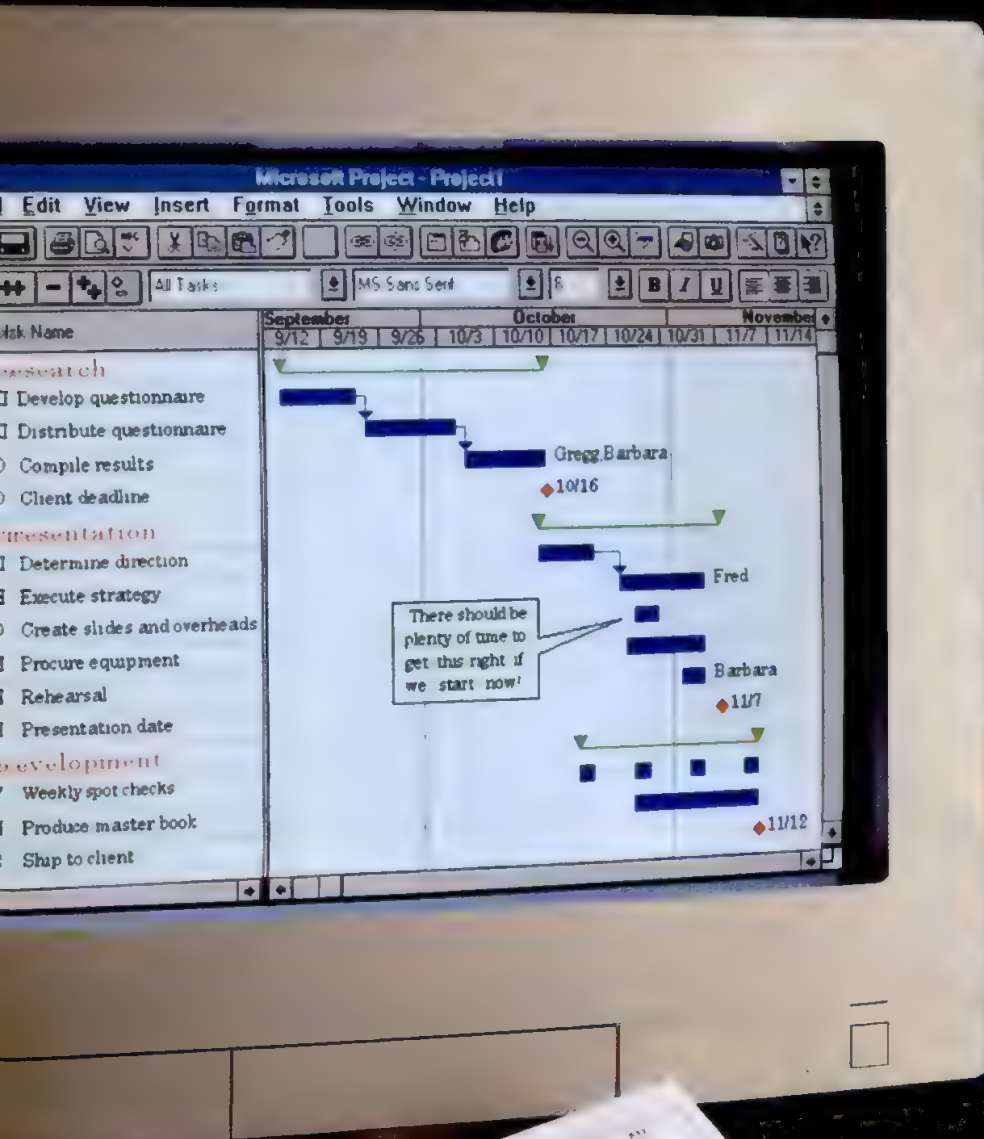
You set up a meeting with GroupSystems V's Meeting Manager. The

SUITABILITY TO TASK

	GroupSystems V	
	Power	Ease of Use
Meeting creation	EXCELLENT	EXCELLENT
Idea processing	EXCELLENT	GOOD
Meeting reports	GOOD	GOOD

Agenda tool prompts the session leader for the topic name and duration of each segment of the meeting. The Agenda tool functions as a kind of autopilot, moving you through your meeting and suggesting tools for participants to use. Each time a new tool is selected, GroupSystems V automatically opens the appropriate pull-

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How We Evaluated Electronic Meeting Support Software

In testing these electronic meeting support packages, PC Magazine Labs focused on a same-time, same-place meeting scenario and tested each of the products in three areas: meeting creation, idea processing, and meeting reports.

We designed our tests to simulate same-time, same-place meetings. For our server, we used a 486/33 system configured with a 200MB hard disk and 8MB of RAM, running Novell's NetWare, Version 3.11, with an Ethernet LAN topology. Depending on the meeting, we used from six to ten IBM ThinkPad 350C notebooks as workstations, each configured with a 125MB hard disk and 4MB of RAM, running DOS 5.0 and Microsoft Windows 3.1. The facilitator's workstation was linked to an overhead LCD panel. We printed

meeting reports on an HP LaserJet 4L printer.

For **meeting creation**, we asked each facilitator to set the agenda and determine the set of tools, as well as the order in which those tools would be used throughout the meeting. The facilitators specified what information would have to be carried over from one meeting tool to the next. They also supplied directions for using each tool.

To test each product's **idea processing** capabilities, participants anonymously generated ideas on their workstations. Next, the facilitator

moved the participants to the idea consolidation tool. The participants then anonymously evaluated the themes using two voting tools: rank ordering (for example, "List these ideas in order of importance from 1 to 10") and resource allocation, in which a set number of points are distributed among the items. Next, the participants filled out a 20-question multiple-choice survey regarding how well the software worked and their levels of computer expertise. Results of each portion of the meeting were viewed both on workstation monitors and on the overhead LCD panel.

Finally, for the **meeting reports** portion of our tests, we used the information gathered during the meeting. The facilitator printed and assessed the visual quality of the agenda, information gathered from each tool, and whatever meeting information each electronic meeting support product provided. —Analysis written by Valerie I. Sessa

down menu and positions its highlight bar on the most likely or most necessary choice. Also, the thorough, well-written documentation explains how to use the tools in their simplest forms as well as how to invoke the more advanced options and features of each.

GroupSystems V's forte is its wide selection of group-process tools. These range from Brainstorming, in which participants respond to issues by typing in ideas that are immediately displayed to the entire discussion group and become stimuli for other ideas, to Stakeholder Identification, which is actually a tem-

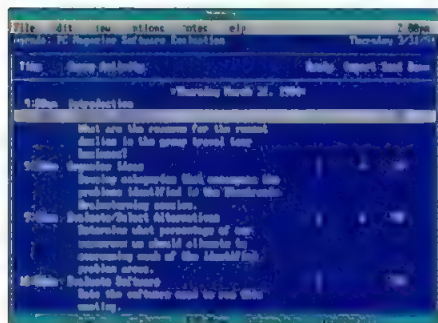
sneak preview. Written from the ground up for Windows, it includes button bars that change according to the context of each group process, a graphical approach to categorizing ideas that lets users drag and drop them into named idea buckets. It also gives users the ability to access meeting handouts and a shared whiteboard, which allows participants to draw simultaneously.

GroupSystems V's toolkit reflects sophistication for addressing various types of meetings. The package still

retains an ease of use, which keeps a group focused on its agenda instead of on the technology.

► **GroupSystems V, Version 1.1.** List price: *basic package, \$24,900.* Requires: *NetWare 2.15 Rev. C or later, DOS 3.3 or later; for file server: dedicated 386DX/25 or better, 4MB RAM, 10MB hard disk space; for each workstation: 450K RAM.* Ventana Corp., 1430 E. Fort Lowell Rd., #301, Tucson, AZ 85719; 800-368-6338, 602-325-8228; fax, 602-325-8319.

Circle 485 on reader service card



The Agenda tool in GroupSystems V prompts the session leader to give the topic name and suggests an appropriate tool based on the chosen topic.

plate for exploring and evaluating issues from other points of view.

GroupSystems V's new Microsoft Windows version was not shipping at the time of our testing. However, we did get a

Meeting Works for Windows

By Valerie I. Sessa

MeetingWorks for Windows, Version 2.1a, was not shipping in time to be included in our roundup. However, we did get a look at a beta edition. MeetingWorks costs \$15,000 per server (up to 100 workstations); the price includes a two-day training course for meeting "chauffeurs" called "Driver's Education" and a one-year service warranty.

Unlike other programs, MeetingWorks requires a chauffeur as well as a regular meeting facilitator. The chauffeur generates the agenda or script for the meeting using MeetingWorks' ScriptWriter tool. The chauffeur then registers participants, moves

them through the script or inserts ad hoc steps during the course of the meeting, and prints meeting reports at the end.

MeetingWorks comes equipped with the typical idea-processing tools: **idea generation**, consolidation, and evaluation. It also offers additional tools such as **multiple criteria analysis**, in which participants rate a list of alternatives according to several criteria usually defined by the meeting participants.

The participant software comes in both DOS and Windows flavors, which can be used at different workstations within the same meeting. The software

Electronic Meeting Support

Eden Systems Corp.

• The Meeting Room

BY VALERIE I. SESSA

Featuring an excellent tutorial, The Meeting Room, Version 1.1, is an easy-to-learn but quirky product. It allows users to "meet" either from their own offices or from remote locations. Priced at \$895 for a ten-user package, it is also considerably cheaper than the other products in this roundup.

The Meeting Room stands apart from the other electronic meeting support products that we reviewed here in that it is designed primarily for same- or different-time, different-place meetings. In addition, the DOS and Windows versions that come bundled together effortlessly share all information, allowing participants to work in either environment and still participate in the same meeting.

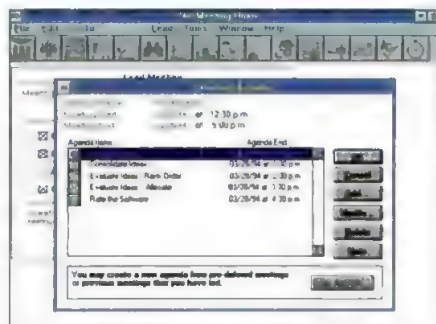
Getting a meeting started in The Meeting Room is simple enough. The

also allows participants to share workstations, yet still participate fully. In other products, it's one vote per machine; with MeetingWorks, several different people can use one machine to cast individual votes that will be counted separately.

MeetingWorks can, through a series of Microsoft Word for Windows macros, produce professional-looking output at meeting's end. If you don't have Word for Windows, MeetingWorks produces an ASCII file that can be imported into other word processors. □

► **MeetingWorks for Windows, Version 2.1a** Enterprise Solutions Inc., 2405 Carillon Point, Kirkland, WA 98033; 206-828-7453; fax, 206-822-9634; BBS, 206-822-8730.

Circle 488 on reader service card



Agenda items in The Meeting Room cannot be passed from one part of a meeting to another, forcing the facilitator to move the agenda to the next item during a meeting.

facilitator or leader invites participants to attend via the product's proprietary e-mail system, or through any VIM- or MAPI-compliant e-mail system. The facilitator organizes and designs the meeting by selecting from a group of agenda items and the tools that go with each agenda item. Unfortunately, the facilitator ends up doing much of the actual design work during the meeting. For example, the facilitator cannot pass the results reached in one part of a meeting on to the next until the first segment has been completed.

This also means that participants have to wait for the facilitator to move the agenda to the next item. The Meeting Room also has a number of features specifically aimed at the needs of same-time, different-place meetings including whiteboard functionality and the ability to add scanned-in photos of meeting participants to user information boxes.

One of The Meeting Room's real strengths is its built-in tutorial, which uses helpful annotations to guide new facilitators and participants through a typical meeting process. There are, however, a few problems. The product has some lapses in logic when it comes to Windows dialogue boxes, occasionally forcing users to go through extra keystrokes or mouse clicks. For example, when the program asks for a user's name, you can't simply hit Enter after typing it in, you must instead click on "OK." More serious, however, is the product's tendency to crash. Although we were able to continue our meeting without losing data, The Meeting Room broke down when we tried to import participants from the NetWare 3.11 bindery. (Eden Systems Corp. has since pinpointed the specific problem and, at press time, was preparing a maintenance release.)

Glossary

agenda A list of the topics and tasks to be addressed in a meeting.

brainstorming A method for generating ideas and opinions about a problem or issue that will be raised during a meeting

decision support room A meeting room with networked workstations for meeting participants and a projection device that can show the images displayed on one computer screen on a large screen shared by all participants.

electronic meeting support software A package of computer tools that aids meeting participants in working toward a group goal or outcome.

facilitator The person responsible for planning and structuring the meeting, setting up the agenda, inviting participants, and running the meeting.

meeting minutes or reports A summary of meeting information such as a description of the meeting, a list of participants and agenda items, and the full content of those items

transparency The concept that participants focus on the objectives of the meeting instead of the workings of the computer

voting The process that allows participants to express where they stand on an issue. Types of voting include rank order, point allocation, and multiple choice.

The Meeting Room's ease of use and variety of features should appeal to those who need an affordable tool for facilitat-

ing meetings held across a network. However, its sometimes quirky operation make a strong case for waiting for the next major upgrade, which is

due for release this summer.

► **The Meeting Room, Version 1.1.** List price: 10-user package, \$895. Requires:

	SUITABILITY TO TASK	
	The Meeting Room	
	Power	Ease of Use
Meeting creation	GOOD	EXCELLENT
Idea processing	FAIR	FAIR
Meeting reports	GOOD	GOOD

VB Power



ISBN: 1-56276-073-4
Price: \$34.95

This innovative guide by Dan Appleman turns Visual Basic programmers into power users by illuminating the tools of the Windows Application Program Interface (API). Includes a time-saving disk that contains source code from the examples in the text, plus a specially designed dynamic link library (DLL).

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THE
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Electronic Meeting Support

3MB RAM (286 machines require 490K), DOS 3.1; for file server: 12MB hard disk space; for each workstation: 10K hard disk space. Eden Systems Corp., 9302 N. Meridian St., #350, Indianapolis, IN 46260; 800-779-6338, 317-848-9600; fax, 317-843-2271.

Circle 486 on reader service card

Collaborative Technologies Corp.

• VisionQuest for DOS • VisionQuest for Windows

BY MARY ELLEN KRANZ

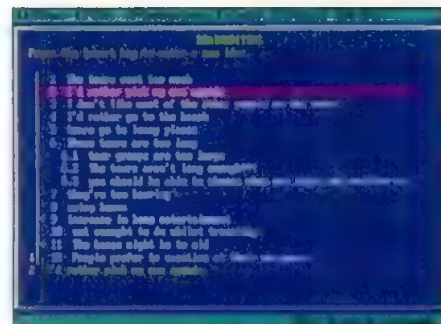
A simple user interface for both the meeting facilitator and participants along with adequate reports make Collaborative Technologies Corp.'s VisionQuest one of the easiest electronic meeting support products to learn and use. On the other hand, this package doesn't have the range of group-process tools that you'll find in Ventana Corp.'s GroupSystems V. But at \$2,995 for a server license plus \$199 per user (1 to 50 users), it's a top-level product at a midrange price.

Installing VisionQuest is a little tricky in that it requires Btrieve 5.0 for NetWare. We had to download Btrieve from a BBS and update our server software before we could get VisionQuest running.

While building an agenda in VisionQuest, the meeting coordinator is prompted to enter the data for each activity that will occur during the meeting. You can input data on the spot, or you can import alternatives generated in a prior activity, such as idea generation.

Like other electronic meeting support packages, VisionQuest features group-process tools for generating, consolidating, and evaluating ideas. The Brainwriting tool, used for generating ideas, is especially nice. Pressing the Insert key opens a small box at the bottom of the screen in which you can type an idea. Pressing Enter adds your idea immediately to the list of ideas, both yours and other participants', at the top of the screen.

You consolidate ideas or alternatives in VisionQuest by placing them into pre-



Simply pressing Enter in VisionQuest's Brainwriting tool allows you to add your idea to the list created by other meeting participants with ease.

determined categories; only the meeting coordinators can create the categories. The tools for evaluating a list of ideas or alternatives, however, are easy to use and will let participants see group results of a vote if they wish.

VisionQuest is also available in a Microsoft Windows version. It looks very much like the DOS version and, unfortunately, acts like it too. It lacks both button bars and drag-and-drop capabilities usu-

ally associated with Windows programs. You can, however, use both the DOS and Windows versions in the same meeting.

VisionQuest

does a good job of electronically supporting meeting processes in a way that is not intimidating to either the facilitator or the participants. This applies to face-to-face meetings as well as those held over a network. The package's range of tools is not as broad as those found in some other electronic meeting support packages, but the power it provides for its price makes it appealing. □

► **VisionQuest for DOS, Version 2.2; VisionQuest for Windows, Version 2.28.** List price: server license, \$2,995; \$199 per user (1 to 50 users). Requires: For file server: 4MB RAM; 4MB hard disk space; NetWare 2.15; Btrieve 5.0 or NLM 5.10. For each workstation: dedicated 386SX or better; DOS 3.1, 2MB RAM. Collaborative Technologies Corp., 3373 Towerwood Dr., Dallas, TX 75234; 800-856-6338; fax, 214-484-7750.

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	SUITABILITY TO TASK	
	VisionQuest Power	Ease of Use
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Idea processing	GOOD	GOOD
Meeting reports	GOOD	GOOD

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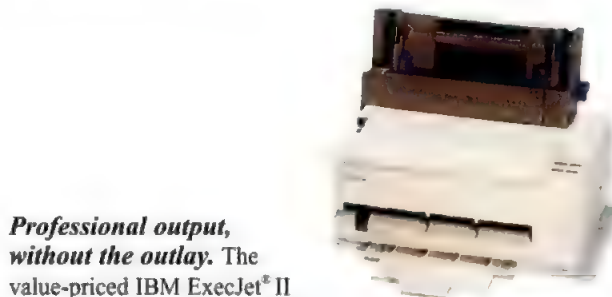
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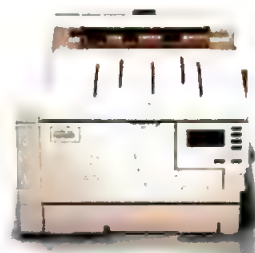
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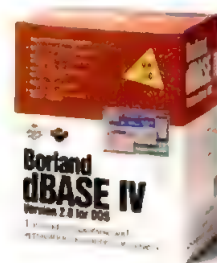
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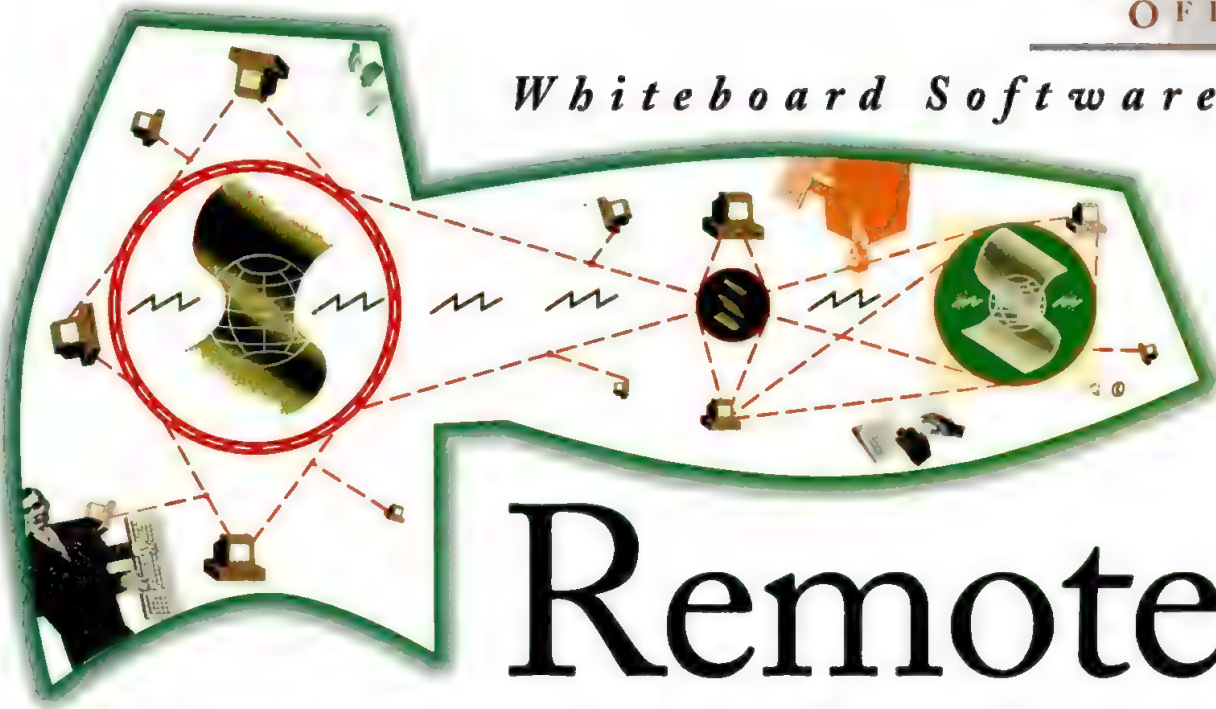
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Whiteboard Software



Remote Possibilities

Today's whiteboard software lets far-flung users collaborate on documents, share applications, and broadcast presentations remotely via LAN or modem. *By Don Labriola*

The current crop of whiteboard software represents a brand-new take on a decade-old idea: linking remote sites together via computer so that people can work together on documents, participate in meetings, or attend presentations. But gone are the dedicated hardware systems and the high-speed links you needed ten years ago. Now, with a computer running Windows and a LAN or modem, remote conferencing is better than the next-best thing to being there.

Today's software-only conferencing products, collectively known as whiteboard software, go well beyond the two-user/one-page limitation of their forebears. Most allow LAN and modem multipoint conferencing, and they often include slide-show presentation tools, screen-capture utilities, and private workspaces where users can store personal data. Although older packages

still force all participants to work together on the same screen, the latest products can handle a variety of independent, parallel activities. We did find the quirks, idiosyncrasies, and glitches that are typical of an emerging application category. But if you need to bring remote users together efficiently and economically, today's whiteboard packages are ready for scrutiny.

In this feature, we look at software-only Windows packages that work with both LAN and modem con-

nections: Intel ProShare Personal Conferencing Software Standard Edition, Version 1.5; IBM's Person to Person for Windows, Version 1.0; Smart Technologies' Smart 2000 Desktop Conferencing Software, Version 3.11; and Future Labs' TalkShow, Version 2.0. We also look at a few notable products that don't fully meet these criteria. In the

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● Holding off for now

Whiteboard software is an emerging application class still trying to define its mission and find an audience. So there's no surprise that none of the four products we tested had the combination of features, ease, and reliability to

make it an Editors' Choice. Each one excelled in one or two areas but did poorly in others.

For point-to-point applications, an honorable mention goes to Intel ProShare Personal Conferencing Software Standard Edition, Version 1.5. It has an elegant design and is an excellent choice if you can live without multipoint capabilities. TalkShow, Version 2.0, also merits an honorable mention. A strong toolset and ease of use make it a natural for

remote presentations, though rigid operational procedures make it less effective for more collaborative tasks.

IBM's Person to Person for Windows, Version 1.0, has a lot of power and flexibility, but we were disheartened by its reliability problems. Smart 2000 Desktop Conferencing Software, Version 3.11, integrates nicely into the teleconferencing environment but frequently puts your conferences on hold to exchange data.

sidebar "Modem Only," we glance at DataBeam's FarSite for Windows, Version 1.0; Modus Software's Synconference, Version 1.0; and RTZ Software's Virtual Meeting for Windows, Version 1.0—all of which work only with modems. Fujitsu Networks Industry's LAN-only DeskTop Conferencing, Version 1.4, is discussed in the sidebar "Fujitsu DTC: LAN Only." Vis-a-Vis for Windows, from WorldLinx Telecommunications, did not ship in time for this review. Crosswise Corp.'s Face to Face, which joins both PC and Mac users in the same desktop conference, was in alpha stage as we put this story together but promises to be worth a look.

IMAGINE SOME LIMITS

These packages provide wildly varying functionality—a clear sign of an immature market trying to find its audience and a sign, too, of the range of uses these products can be put to. Some packages are designed for point-to-point document conferencing, some for multipoint conferences, others for broadcast meetings, and still others for use with audio or video conferencing systems. The features and

design paradigm of one package may make it ideal for one of these uses but severely handicap it for another.

A telecommuter or mobile worker might use document conferencing to review a proposal, page layout, or contract with a colleague at the home office. Such a highly interactive two-way session requires a good selection of annotation tools and flexible import and export capabilities. The ability to exchange typed messages in a chat box is also helpful when working from a hotel room that doesn't have a second line for voice communications. In our roundup, we found Intel's ProShare excels for such applications. It is strictly for two users and lacks a dedicated chat facility, but its tabbed-notebook interface and flawless operation make it a breeze to use.

Quite another use for whiteboard software is multipoint conferences, where both LAN and modem connections are used to link a larger number of participants. These distributed desktop meetings may involve concurrent activities and require administrative tools that help users keep track of each other. IBM's

Person-to-Person is designed to suit this need, with chat boxes and the ability to handle parallel activities by subgroups within the larger meeting.

Whiteboard software can also be useful for broadcast meetings, such as remote presentations, educational seminars, and other applications that require one person to broadcast slides to a far-flung audience. Here, thumbnail slide sorters and multi-user chat facilities that enable interactive question-and-answer sessions are a must. Enter Smart 2000 and TalkShow. They ensure that all users are viewing the same screen at the same time, which makes them ideal for presentations (though ill suited for more collaborative exchanges).

Finally, some users look to whiteboard packages to add another dimension to traditional audio or video conferences, so users can exchange computer-based information along with having a voice or video connection. Smart 2000, which integrates easily with high-end conferencing hardware, is the logical choice here.

STILL A WAY TO GO

One particularly weak area for most of the packages is modem communications. Except for ProShare, none of the packages we tested could keep annotations and pointer movements in sync at 14.4 kilobits per second (Kbps). Some took nearly 2 minutes to transmit a complex full-screen image even when using data compression. Compatibility is another issue; we found most programs are finicky about which modems they work with.

Suitability to Task: Whiteboard Software

Our Suitability to Task categories reflect the varied uses of whiteboard software products.

One use of a whiteboard product is to enable far-flung users to work jointly on document-intensive projects such as presentations and layouts

Interactive document sharing looks at how well each package handles high-resolution, true-color graphics and how quickly and easily files can be exchanged. Does the product have flexible import and export capabilities? Does it support OLE?

Sometimes you need a product geared toward **distributed desktop meetings**. To suit this

Our Contributors: DON LABRIOLA is a frequent contributor to *PC Magazine*. BEN Z. GOTTESMAN is a technical director of PC Magazine Labs, and THOMAS MACE is an associate editor of *PC Magazine*.

How We Evaluated the Whiteboard Software

With such varying products in this emerging application category, across-the-board comparative performance tests were not a viable option for this story. Instead, our whiteboard software tests focused on features, robustness, and ease of use.

We put each product through a broad mix of standard whiteboard tasks, including slide preparation, presession file transfer, and remote slide presentations. Any features for setting up clients remotely were also exercised.

We then tested document sharing, exercising the available range of real-time tools for marking up text and graphics. In this context, we also looked at any available chat features. The next test group

covered any available application-sharing features. Using Microsoft Excel 5.0, we tested synchronized execution of an application on two machines, remote execution of an application on a single machine, and support for remote OLE links.

All tasks were first performed using a point-to-point modem connection running at 14.4 Kbps with compression enabled. Modems were set up using program-supplied definitions or, if those

were unavailable, Hayes defaults. We repeated our tests at 2,400 bps to see whether low-speed connections offered acceptable performance.

For packages that support multipoint connections, we also ran distributed-meeting tests using heterogeneous LAN and modem connections. These tests repeated the document-sharing tasks but included adding an extra connection in mid-session. We also exercised any available features for cataloging network users and administering remote meetings.

We tested using Compaq Deskpro 486/33M systems with 16MB of RAM. Modem connections were made using matched Zoom FaxModem VFX V.32bis units. We ran the LAN and modem tests using Novell's NetWare 3.11 running on a Token-Ring network.

If you can work around these problems, though, whiteboard software is worth the investment. It gives you many of the benefits of a face-to-face encounter without the travel expense. The reviews that follow should help point you toward the product that best suits your needs.

Intel Corp.

Intel ProShare Personal Conferencing Software Standard Edition, Version 1.5

ALL REVIEWS BY DON LABRIOLA
Intel ProShare Personal Conferencing Software Standard Edition, Version 1.5, is one of the friendliest document-confer-

encing packages you're likely to find. This product (a software-only version of Intel ProShare Personal Conferencing Video System 200, reviewed in this issue's story "Seeing Is Almost Believing") has an elegant user interface and was a breeze to install and configure. The \$99 package lacks a true chat facility and cannot handle more than two simultaneous users, however, so if multipoint conferencing is what you need, you'll have to look elsewhere.

With ProShare, you work in an intuitive tabbed notebook that holds an unlimited number of shared and private pages. Both participants can access any page by simply clicking a tab, and double-clicking brings both users to the same page. The transfer of files and images always takes place in the background, which helps alleviate the

interruptions that plague other programs. The package also lets you conference with someone who doesn't own a ProShare license; simply select the Jump Start feature, which automatically generates and downloads a limited-use guest copy.

Like most document-conferencing packages, ProShare isn't very good at creating slides from scratch. It can import bitmapped images and was the only package we tested that treats all annotations

SUITABILITY TO TASK

Intel ProShare Personal Conferencing Software Standard Edition, Version 1.5

	Power	Ease of Use
Interactive document sharing	GOOD	EXCELLENT
Distributed desktop meetings	POOR	POOR
Remote presentations	GOOD	EXCELLENT
Boardroom meetings	FAIR	FAIR

purpose, a package needs strong administrative tools and should allow a large number of people to participate. Attendees should be able to join and leave the meeting without crashing the entire group. The software must make provisions for incompatible displays and a variety of communications hardware

ence? The package should provide a real-time question-and-answer mechanism (such as a chat

SUITABILITY TO TASK

Company Name	Power		Ease of Use	
	Power	Ease of Use	Power	Ease of Use
Interactive document sharing	EXCELLENT	POOR		
Distributed desktop meetings	GOOD	FAIR		
Remote presentations	FAIR	GOOD		
Boardroom meetings	POOR	EXCELLENT		

box) and be able to handle multiple messages coming in simultaneously.

The **boardroom meetings** task rates how well a product fits into the existing teleconferencing

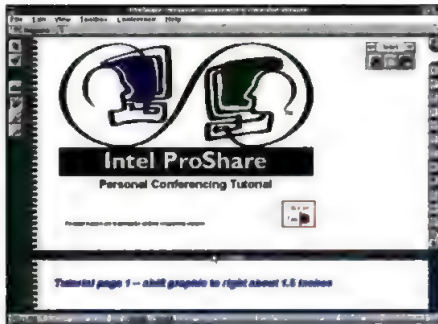
continuum. Is it compatible with industry standards and special-purpose peripherals such as touch-sensitive screens? Can the package be used with a voice/data modem or integrated with a desktop video system?

To excel in **remote presentations**, where one user is asked to address a widely dispersed audience, a package must have strong slide-show facilities. Can a large number of people participate in the confer-

and imported data as movable objects, but it can't stretch, group, or align objects. It also has no graphics drawing tools, and it provides only one typeface. Plan on composing your slides in a dedicated graphics program and importing them using ProShare's screen-capture or OLE 2.0 capabilities. Another alternative is to use ProShare's print-capture driver, an excellent feature that redirects the full-color printer output of any Windows application to the current ProShare notebook.

ProShare's lack of multipoint capabilities is a handicap, but in reliability and ease of use it equaled or surpassed every other product we tested.

Whiteboard Software



ProShare's tabbed-notebook paradigm makes navigation a snap.

► Intel ProShare Personal Conferencing Software Standard Edition, Version 1.5.

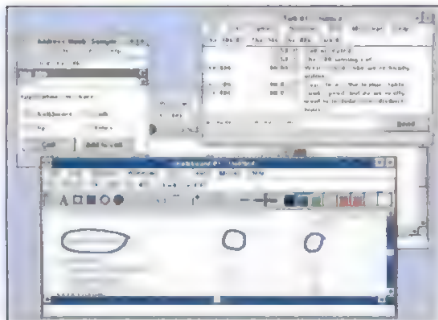
List price: \$99. Intel Corp., 2200 Mission College Blvd., P.O. Box 58119, Santa Clara, CA 95052-8119; 800-538-3373, 503-629-7354; fax, 503-629-7580.

Circle 471 on reader service card

IBM Corp.

● Person to Person for Windows, Version 1.0

In many ways, IBM Corp.'s Person to Person for Windows, Version 1.0 (\$280), is the most advanced package in our roundup. A Person to Person conference can encompass any number of concurrent whiteboards, file transfers, and chat boxes, each involving a different combination of participants. Person to Person lets users cut and paste items across the network and even view incoming motion video. And no matter how complicated things get, simple but effective administrative tools make it easy to tell which users are participating in each activity. We found serious reliability problems in this first release, however, along with some interface awkwardness that made the product a trial to use.



Person to Person's file-sharing tools are excellent; its design, however, can be cumbersome.

Person to Person consists of seven discrete applets that each provide one communications medium—such as a whiteboard or chat box—that can run in any combination. Person to Person's Call Manager module manages the various connec-

tions from behind the scenes. Up to eight people can participate in a session, and the attendees can break into smaller groups and work on items separately.

This flexibility, though, comes at a price. Having separate applets for each function rather than a single control panel can become cumbersome. Worse, the Call Manager requires custom communications settings and provides direct support for

only half a dozen modems. Though we eventually got Person to Person to work most of the time, testing wasn't without headaches. Modems refused to dial or answer, connections spontaneously terminated, and computers locked up at random.

IBM is aware of the problems we had and hopes to have some of them corrected by the time you read this.

When Person to Person is working, it's a great medium for ad hoc confer-

encing. The flexibility of both free-form meetings and parallel activities gives it a leg up on the other packages we looked at. If the next release smooths some of the rough edges, it could be a contender.

SUITABILITY TO TASK

Person to Person for Windows, Version 1.0

	Power	Ease of Use
Interactive document sharing	GOOD	FAIR
Distributed desktop meetings	EXCELLENT	POOR
Remote presentations	FAIR	POOR
Boardroom meetings	FAIR	FAIR

■ Fujitsu DTC: LAN Only

By Ben Z. Gottesman

Cross a PC remote-control program and a whiteboard package and you'll get a feel for Fujitsu Network Industry's unique DeskTop Conferencing (DTC), Version 1.4. The flexible package (\$99 for a three-user starter kit, \$299 for each additional user) is ideal for working on collaborative projects, where input from all members of a LAN-based group needs to be incorporated immediately. Versions are available for use on ISDN and Novell IPX LANs, and support for modem connections is expected in an upcoming release.

DTC lets up to eight participants work on a live file that reflects changes as the meeting progresses. Employing a chaired-meeting scenario, DTC allows the designated chair to broadcast his screen at any time. Each participant can then annotate the master screen. The chair can pass control of his keyboard and mouse to another participant or pass the chair to another user, allowing that user to share his display. Users can also chat during a conference, transfer files, or even broadcast the contents of the Clipboard. Screens

can be saved to the Flipchart Organizer for reference and reuse.

DTC is not without faults. Updates to the chair's screens drew much more slowly on the remote screens than in other remote-control programs, and the only tool for annotation is a free-form pen, so users are limited in the type and quality of annotations they can make. Fujitsu promises that Version 2.0, due this summer, will add improved whiteboard tools.

On the plus side, Version 1.4 has added support for Lotus SmartSuite and Lotus Notes. DTC can be launched from within these applications, and flip charts can be stored in a Notes database.

For many users, DTC's ability to share an active screen will be far more valuable than drawing on a static whiteboard. The improvements due in the next version should add the polish this program needs. □

► **DeskTop Conferencing, Version 1.4.** List price: \$299. Fujitsu Networks Industry Inc., Soundview Plaza, 1266 E. Main St., Stamford, CT 06902-3546; 800-446-4736, 203-326-2700; fax, 203-326-2701.

Circle 474 on reader service card

Whiteboard Software

► **Person to Person for Windows, Version 1.0.** List price: \$280. IBM Corp., 11400 Burnet Rd., Austin, TX 78758; 800-426-9402; fax, 512-823-1864.

Circle 470 on reader service card

Smart Technologies Inc.

● Smart 2000 Desktop Conferencing Software

Smart Technologies' Smart 2000 Desktop Conferencing Software, Version 3.11 (\$295), is a software-only version of the company's high-end boardroom conferencing product. The desktop system doesn't have its sibling's touch-sensitive whiteboard and wireless pens but does offer advanced boardroom features such as scanner support and still-image capture from a video camera. Another plus is its ability to communicate through the data port of a videoconferencing-system codec, which makes integration with high-end systems possible. Unfortunately, its user interface lacks standard Windows features such as a menu bar, on-line help, an Undo function, and Clipboard support, and its slide-projector paradigm makes it too confining for some uses.

In a Smart 2000 conference, all users are locked into tight synchronization. Although the program's Notepad workspace holds up to 300 pages, only 1 page can be shared at a time; when any user turns the page, everyone else follows. There are no private work areas, chat facilities, or other mechanisms that might facilitate side activities. The product also can't perform background data transfers, which means the meeting freezes every time a user captures a screen, imports a graphic, or displays a slide that other participants don't have on-disk.

Smart 2000's most impressive feature is its Share function, which lets one user launch identical copies of a Windows application on every PC in a conference. The person who executes the shared programs is the only one who can control them, but the feature can be very

effective for tasks like on-line training.

Smart 2000 is impressive but too inflexible to recommend as an across-the-board solution. Consider it only if you're interested in giving LAN-based presentations, sharing applications in real time, or integrating document conferencing into

SUITABILITY TO TASK

Smart 2000 Desktop Conferencing Software, Version 1.0

	Power	Ease of Use
Interactive document sharing	POOR	POOR
Distributed desktop meetings	POOR	POOR
Remote presentations	GOOD	FAIR
Boardroom meetings	EXCELLENT	GOOD

videoconferences or traditional meetings.

► **Smart 2000 Desktop Conferencing Software, Version 3.11.** List price: \$295. Smart Technologies Inc., 1177 11th Ave. SW, #600, Calgary, Alberta, Canada T2R 1K9; 403-245-0333; fax, 403-245-0366.

Circle 472 on reader service card

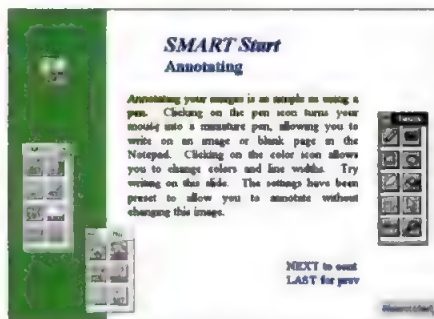
Future Labs Inc.

● TalkShow, Version 2.0

Future Labs' TalkShow, Version 2.0, has a lot going for it. The \$199 package supports multipoint conferencing, lets dissimilar modems communicate with one another effortlessly, and offers an excellent selection of conferencing features. TalkShow is especially well suited for on-line training and remote presentations; a few arbitrary constraints limit its effectiveness for other applications.

TalkShow's robust feature set includes a chat facility, OLE 1.0 support, pop-up menus, eight zoom levels, and a range of graphics tools and text-styling options. It was also the only package we tested that lets you stretch and resize imported graphics files. Talk-

Show also excels in its ability to handle high-speed modem communications. It offers direct support for only 30 modems but is so robust that we were able to use its



Smart 2000's user interface lacks the usual Windows toolbar, though it does have intuitive iconic tool palettes.

■ Modem Only

By Thomas Mace

A well-rounded whiteboard package should offer both LAN and modem support. While the following products make modem-only connections, their features make them worth investigating.

► **FarSite for Windows, Version 1.0** (\$179; DataBeam Corp., 606-245-3500), is a point-to-point conferencing package that concentrates on remote presentations and interactive conferencing based on simultaneously viewed images. It provides a number of real-time whiteboard annotation features, including pointers, drawing tools, and a slide tray for capturing changes made to any slide. A zoom feature provides close-ups of simultaneously viewed slides. Support for standard LANs is expected soon.

► **Synconference, Version 1.0** (\$395; Modus Software, 415-964-1936), is a point-to-point Windows whiteboard package that concentrates on remote slide presentations. Pointer and free-hand drawing tools let both participants annotate a presentation in real time. Two copies of Synconference are needed to support all features, although each copy includes a listener-only module.

► **The Virtual Meeting for Windows, Version 1.0** (\$3,600 for ten licenses; RTZ Software, 408-252-2946), specializes in multimedia presentations. Its multimedia player lets all participants view video or slide presentations simultaneously. Before a session, users will need to transfer all needed files to every participant. An additional whiteboard module with drawing and text tools lets all participants work together and does not require an initial download. NetWare and TCP/IP support should be available by mid-summer. □

► SUMMARY OF FEATURES

Whiteboard Software

Products listed in alphabetical order

■ = YES □ = NO

List price
General
Number of licenses required

Guest copy included/Self-downloading
On-line help
Modem/Network diagnostics
Vendor offers videoconferencing upgrade

Communications

Modem speeds (Kbps)
LANs supported

ISDN

File transfers:
Via Clipboard
Pauses other activities
Type of compression employed

Auto-dialer/address book

Auto-redial
Multiple address books

Conferencing Features

Maximum number of attendees
Peer-to-peer meetings
Chaired meetings
Poster can change after meeting starts
Software announces requests to join
Application sharing/remote control
Undo
Slide sorter/Presenter
Text chat box
Private chats
Passwords

Whiteboard workspace:

Maximum number of private/shared workspaces

Pages per private/shared workspaces

Synchronized/independent page turns
Zoom levels

Annotation tools:

Number of markers and pens
Text tool
Graphics drawing tools
Other annotation tools

Number of annotation colors

Choice of font sizes (points)
Tools can edit typed text

Data Import/Export

DDE/OLE
Remote cut-and-paste
Remote links
Import file formats

Export file formats

Print-capture import driver included
Capture full screen/window/user-definable region

Support

Technical support hours (eastern time)

Toll-free support line
Other available support

Intel ProShare Personal Conferencing Software Standard Edition	Person to Person for Windows	Smart 2000 Desktop Conferencing Software	TalkShow
\$99.00	\$280.00	\$295.00	\$199.00
1 per conference	1 per user	1 per user	1 per conference
■ ■	□ □	□ □	■ □
■ ■	■ ■	■ ■	■ ■
■ ■	■ □	■ ■	□ □
■	■	■	□
2.4-19.2 IPX, Windows for Workgroups NetBEUI, some NetBIOS	9.6-57.6 IPX, NetBIOS, TCP/IP	2.4-57.6 IPX, NetBIOS, TCP/IP	1.2-57.6 NetBIOS, Novell's LAN WorkPlace, Sun PC-NFS, some TCP/IP
■	■	■	■
□	■	□	□
□	□	■	■
JPEG	Proprietary	JPEG, proprietary lossless	JPEG, proprietary lossless
■ ■	■ ■	■ ■	■ ■
□	□	□	■
□	■	□	□
2	8	64	Unlimited
■	■	■	■
□	□	■	□
N/A	■	■	■
N/A	□	■	■
□ □	□ □	■ ■	□ □
■	■	■	■
□ □	□ □	□ □	■ ■
□ □	■	■	■
N/A	■	N/A	■
□	□	■	□
1/1	Unlimited/ Unlimited	None/1	2/1
Unlimited/ Unlimited	1/1	None/300	Unlimited/ Unlimited
■ ■	■ □	■ □	■ □
None	None	Variable zoom	8
3	1	2	2
■	■	■	■
□	■	■	■
■	■	■	■
Object select, remote pointer	Erasers, remote pointer	Screen blank, clear annotations, remote pointer	Grabber, object select, remote pointer, eraser
16	8	16	16
1-50	None	Unlimited	Unlimited
■	□	□	□
□ ■	■ □	□ □	□ ■
□	■	■	□
■	■	■	□
■	■	■	■
.BMP, .DIB, .GIF, .PCX, Targa, TIFF Proprietary	ASCII, .BMP, .PCX, TIFF ASCII, .BMP, .PCX, TIFF, proprietary	.BMP, .GIF, JPEG, .PCX, .TGA, TIFF .BMP, JPEG, proprietary	BMP, GIF, PCX, JPEG, Targa, TIFF Proprietary
■	□	□	□
■ □ □	□ □ □	■ □ □	□ □ □
10:00-8:00 M-W, F, 10:00-6:00 Thurs.	8:00-5:00 M-F	9:00-8:00 M-F	11:00-6:30 M-F
□	■	□	□
CompuServe forum private BBS, fax, toll-free fax-back	CompuServe forum	Private BBS	Private BBS

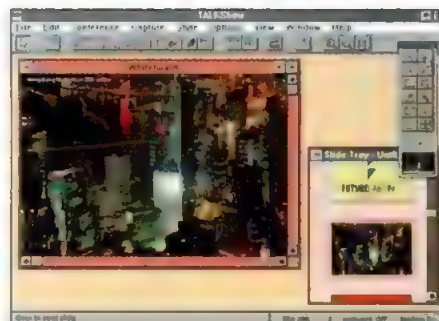
SUITABILITY TO TASK

TalkShow, Version 2.0

	Power	Ease of Use
Interactive document sharing	FAIR	FAIR
Distributed desktop meetings	FAIR	FAIR
Remote presentations	GOOD	EXCELLENT
Boardroom meetings	POOR	POOR

generic Hayes-compatible driver with mixed-modem connections at 14.4 Kbps.

TalkShow's one weakness is its restrictive paradigm. The design assumes a single presenter will use the presentation tools to copy slides one at a time from his slide tray to the whiteboard, where they can be discussed, annotated, and saved in the archive. Hence, the program gives each user private archives and multipage slide-tray workspaces, but shared work areas are limited to the one-page whiteboard. This approach is fine for training and remote presentations but doesn't always work well for other types of activities. It would be difficult, for example, for two users to prepare slides jointly beforehand, because of the program's inability to cut and paste annotations between slides or to add a white-



TalkShow's slide-show paradigm is limiting but ideal for remote presentations.

board image to an existing slide tray.

Although TalkShow imposes a structure on meetings that may not always be to your liking, it does offer reliable operation, a good Windows interface, and a solid selection of graphics and annotation tools. If you're primarily interested in remote presentations, TalkShow's strengths will be welcome. □

► **TalkShow, Version 2.0.** List price: \$199. Future Labs Inc., 5150 El Camino Real, #E-4, Los Altos, CA 94022; 800-933-8887, 415-254-9000; fax, 415-254-9010.

Circle 473 on reader service card

**HOW MUCH
CAN ONE MAIL
SYSTEM DO?**

Can a mail system let you and everyone else in your office do more? Can it save you time, money and headaches? Can it keep you

ing in. And send faxes right from your word processor. Whether you're in Microsoft Word, Microsoft Excel, Lotus' 1-2-3 or WordPerfect.

learning to send and receive mail easy. And if you're going to be away, Mail's Out of Office feature will automatically forward a message to everyone who tries to get in contact with you while you're out.

You can save even more time

by adding other features that are just as easy to use as Mail. Like Schedule+, the best-selling scheduler for Windows. It helps you manage your calendar and reminds you of meetings and deadlines.

With Schedule+ you'll spend less time rounding people up for meetings, because Schedule+ lets you see when the people you need are free. So you can pick a time that's convenient for everyone.

YOU DECIDE.

connected whether you're down the hall, or down under on an important business trip?

Microsoft Mail can. No wonder it's the best-selling LAN-based mail product in the world.

But first things first. How will Microsoft Mail work with what you already have? Perfectly. Whether you're in MS-DOS, the Windows™ operating system, on a Mac, or OS/2. And you can send mail without exiting the application you're work-



With Mail Remote, you don't need to be in your office to keep in touch. And with wireless service you don't even need to be near a phone. You can log in anywhere.

How can Microsoft Mail save you time? Mail has smart, sensible symbols and online help that make

It even shows you when everyone else is free. So you can schedule meetings without a lot of legwork.

Want to cut down on paperwork? Use Microsoft electronic forms to speed expense reports, vacation requests and any other routine forms through your office at the speed of light. And you can track them easily. So you won't have to worry that an important request has disappeared into a black hole.



With electronic forms, you never have to worry that important paperwork is stuck in traffic. You'll be able to track expense reports, vacation requests and other important forms as they speed safely through your company.

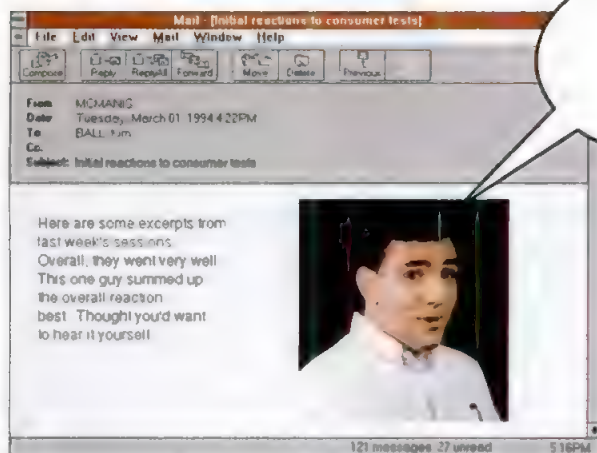
Finally, with Mail Remote you can avoid disasters by staying connected while you're on the road, because Mail Remote lets you work just like

you do in your office. It can even save you money. Just read the important messages, then let Mail Remote respond automatically when rates are lowest.

No other mail system is easier to use. Or gives you so many different ways to stay in control of your work. To prove it, we'll send you a free demo disk. Once you've seen everything you can do, deciding on a mail system will be easy. Just call (800) 871-3271, Dept. E5S.

Microsoft Mail is the best-selling LAN-based mail product in the world. Add Schedule+ for a personal time-management and group scheduling system. And electronic forms to speed paperwork through your office. Take them all on the road with Mail Remote.

Together they'll make your whole organization more productive than you ever could have imagined.



Cool.

Microsoft Mail gives you an infinite number of ways to be more persuasive. Send words, graphs, pictures and sound as mail messages. There's almost no limit to what you can send.

Schedule+'s alarm clock reminds you of meetings, deadlines, anything. So you'll stay organized and save time. Without it, we might have forgotten this caption entirely.



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CIRCLE 318 ON READER SERVICE CARD

think you're looking at a live video picture of the person, you're actually seeing how he looked a second ago. So when you tell that really funny joke, he's deadpan for what seems like an eternity.

It will probably be a long time before people accept the idea of video cold-calling. Most business transactions will begin with a face-to-face meeting, as they do now. After you know a person, it's easier to accept the low resolution and the ergonomic inconveniences. Videoconferencing will no doubt serve to decrease the feeling of isolation that comes with telecommuting and will be useful for follow-up job interviews, interactive training, and sales calls.

REVIEW CRITERIA

To qualify for this roundup, a videoconferencing system had to run on an MS-DOS or Windows-based desktop PC and transmit live video over ISDN lines, POTS lines, or Ethernet-based LANs. (For a discussion of ISDN and other communications links, see the sidebar "Making the Connection.") It also had to be shipping in quantity at the time of testing. The seven systems we received were from AT&T Global Information Solutions, Intel Corp., InVision Systems Corp., MRA Associates, Northern Telecom, PictureTel Corp., and Specom Technologies Corp. AT&T and Northern Telecom are large, well-known communications conglomerates with an obvious interest in promoting video communications. Intel, the largest manufacturer of microprocessors for the PC, has a lot to gain from marketing a new processor-intensive application. PictureTel is a manufacturer of room-based videoconferencing systems, while InVision, MRA, and Specom are small newcomers to the PC applications market.

Systems from Acer America Corp., InSoft, NUTS Technologies, Viewpoint, and V-Tel were not shipping at the time of testing. Datapoint Corp., EyeTel Com-



• AT&T Telemedia Personal Video System

Desktop videoconferencing is still in its infancy, and these first-generation products leave plenty to be desired. Still, the AT&T Telemedia Personal Video System earns an Editors' Choice for offering the best mix of features and performance. The

Telemedia system was the only reviewed product that offered true application sharing, which lets two parties actually work together in real time rather than just marking up images or passing files back and forth.

At \$4,995 per seat, the Telemedia System is priced competitively with other products that run over ISDN lines. It offers smoother video than most and is compatible with the Common Intermediate Format H.320 standard for boardroom videoconferencing products. AT&T backs Telemedia with 24-hour, 7-day-a-week technical support.

Two ISDN-based videoconferencing solutions merit honorable mentions. The PictureTel Live PCS 100 system, \$5,995 per seat, nearly matches the AT&T system's features. It offers especially impressive video quality and H.320 support but lacks

application-sharing capabilities.

The Intel ProShare Personal Conferencing Video System 200 combines high-quality videoconferencing and whiteboard capabilities at an unbeatable price. When purchased with ISDN service from a regional phone company, the ProShare System 200 can sell for as little as \$999, including hardware. This summer, Intel will release a Premier version that adds application sharing. H.320 support is also planned for a future release.

We don't recommend any of the products that run over LANs or analog telephone lines; today, their limitations outweigh their advantages. InVision Systems Corp.'s InVision (\$995 per user) comes close to offering an effective LAN-based solution but is hampered by its limited audio quality and troublesome installation.

munications, GTE Vantage Solutions, and IBM Corp. had shipping products but did not submit them in time for testing. Twincom declined to participate. IBM's Person-to-Person whiteboard system is reviewed elsewhere in this issue (see the article "Remote Possibilities").

Though we did not review GTE's Desktop Video Teleconferencing System in-house, we observed a demonstration of the product, which sells for \$12,900 per node (including camera, three expansion boards, microphone, and speakers) and runs over ISDN, Switched 56, or even regular telephone lines via modem. Video was remarkably crisp over ISDN, and the

included whiteboard software seemed quite versatile.

The systems from AT&T, Intel, Northern Telecom, and PictureTel were tested over ISDN connections. One of the four, Northern Telecom's Visit Video, required a separate analog telephone line for voice communications. InVision's product could be tested only over Ethernet, and MRA's VidCall and Specom's Picfon System were meant for modem communications over regular telephone lines. Where manufacturers did not market complete packages (MRA's is a software-only product, for example), we asked the vendor to supply us with third-party hardware add-ons.

In each case we installed two complete systems, dialed up, and tested for image clarity, accuracy of color rendition, and smoothness of transmitted motion video. Since videoconferencing systems use video compression algorithms that can

Our Contributors: BILL MACHRONE is vice president of technology at Ziff-Davis Publishing Company. FRANK J. DERFLER, JR., is senior networking editor and JOHN R. QUAIN is a contributing editor of *PC Magazine*. HOWARD ALEXANDER and STEVEN C.M. CHEN are frequent contributors to *PC Magazine*. LEON ERLANGER was the associate editor in charge of this story, and MICHAEL J. ZULICH was the project leader who supervised testing.

Desktop Videoconferencing

slow down the transmitted frame rate if there is a lot of motion at one end, we varied the degree of motion to see whether the image became choppy. We tested any included document-sharing software for features and ease of use.

Our test-bed consisted of a 486DX2/66 Compaq Deskpro/M with 12MB RAM, a 256K L2 cache, a 323MB Conner hard disk, a Compaq QVision graphics card, and an NEC MultiSync 4FG monitor. AT&T sent its own 486DX2/66-based AT&T Model 3333 system with 16MB RAM, a 324MB Western Digital hard disk, 256K L2 cache, a Diamond Stealth Pro graphics card, and a 17-inch AT&T monitor.

BITS AND PIECES

There are many different approaches to creating a videoconferencing system, but they all start with a camera. Some cameras mount on top of the monitor, others on a pedestal or on the desktop. The closer to the monitor you can place the camera, the more natural you will appear: When you look into the lens, the other party will see you as looking at him or her. A zoomable or multiple-focal-length lens is very desirable, as is focus control.

Suitability to Task:**Desktop Videoconferencing**

PC-based videoconferencing is a nascent technology, and the tasks that users will perform with these products have yet to be defined clearly. We believe that effective videoconferencing will ultimately incorporate two components: smooth, high-quality video (and audio), and the ability to collaborate over documents and images. Our Suitability to Task ratings reflect the capabilities of the tested systems in each of these areas.

In the **video phone** category, we rate video quality, including fluidity of motion, accuracy of color reproduction, and overall clarity of the image. Our ratings also take into account the quality of products' audio reproduction, ease of initiating calls, compatibility with existing videoconferencing standards, extent of camera controls, and the capabilities of the telephone/address book. To merit a *good* rating for "power," the product had to provide legible video running at

Longer focal lengths exclude extraneous items (like your messy office) from the scene and are more flattering than the nose-enlarging wide-angle settings. You'll need a wide-angle focal length, however, to have two or three people in front of the screen. The systems we tested from Intel and PictureTel offer both close-up and wide-angle settings.

Systems vary in the way they implement the audio part of videoconferencing. Intel's ProShare System 200 uses a sophisticated Plantronics earpiece microphone, while most others use a telephone handset or two or more microphones arranged in a noise-canceling configuration, usually built into the camera base. Most transmit digitized and compressed audio over the same line used for video, but MRA's VidCall and Northern Telecom's Visit require a separate analog telephone line for audio.

The rest of the pieces are inside the computer. The reviewed systems from AT&T, Intel, and PictureTel are implemented in two boards per PC; InVision's comes with one, and Specom's comes with three. The InVision and VidCall are software-only, and they require third-party hardware.

SUITABILITY TO TASK

	Company Name	
	Power	Ease of Use
Video phone	EXCELLENT	FAIR
Document conferencing	GOOD	POOR

8 frames per second or faster, with well-synchronized audio and video. To receive an *excellent* rating for "power," the product also had to support the H.320 standard, which lets it communicate with high-end conference-room videoconferencing systems.

In the **document conferencing** category, we rate products on their ability to share data and to allow simultaneous, real-time collaboration over documents and images. To achieve a *good* rating for "power," the product had to have a whiteboard that lets users share and annotate data (with both text and graphical "ink") during a call. Support for OLE links and a variety of markup tools contributed to this rating. To receive a score of *excellent*, the product had to have application-sharing capabilities that let two users work on the same document simultaneously.

The heart of every system is the codec, or coder/decoder, which takes the avalanche of information from the camera and compresses it for transmission. The codec depends on the fact that little changes from frame to frame. Your mouth and eyes may move up and down; you may change position. But most of the information in the frame was exactly the same as in the previous frame and doesn't need to be transmitted. On the other end, a matching codec decompresses the image using mirror imaging and other techniques, such as interpolating movement. If you sample two frames, for instance, you can figure out what happened between them and present an interpolated third frame to give the appearance of smoother motion.

At its heart, a codec is nothing more than a hardware implementation of a software algorithm. Codecs are very calculation-intensive, especially on the compression side. All the reviewed systems except two use hardware to compress and decompress the video image. Intel uses hardware compression on the camera side and software decompression on the playback side. VidCall is a software-only product without any compression. The Intel package and InVision (which works with either Intel's Action-Media II or Media Share's Mambo) use Indeo, which is derived from DVI, a compression technique that began at RCA's Sarnoff Labs, intended for an early digital laserdisk player. Others use proprietary compression techniques. The AT&T and PictureTel systems use compression methods compatible with H.261, a subset of H.320.

Videoconferencing used to be much easier: You'd call up Compression Labs or PictureTel, which would build it into your conference room for \$25,000 or more—sometimes much more. You'd lease a fractional T1 line—typically running at 384 kilobits per second—from the phone company, and you'd be in business. Conference room systems, which use better-quality codecs, have a higher frame rate and better resolution than desktop systems. The desktop systems settle for lower resolutions and frame rates in order to work with line speeds in the vicinity of 100 Kbps. The H.320 specification allows for both the high-speed and lower-speed formats.

Down the road, sophisticated compression technologies like MPEG-1 and -2

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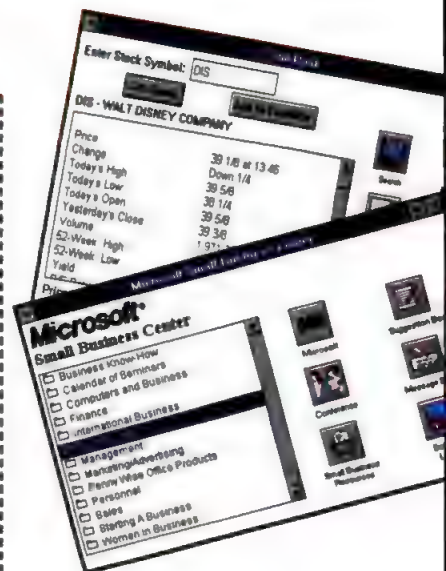
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Desktop Videoconferencing

point-to-point basis, however.

► **AT&T Telemedia Personal Video System.** List price: Boards, camera, software, \$4,995; with AT&T PC, \$9,151. Requires: 386-based PC or better, 8MB RAM, VGA with VESA feature connector, Microsoft Windows 3.1. AT&T Global Information Solutions, 1700 S. Patterson Blvd., Dayton, OH 45479-0001; 800-225-5627, 513-445-5000.

Circle 451 on reader service card

Intel Corp.

• Intel ProShare Personal Conferencing Video System 200

BY JOHN R. QUAIN

The straightforward installation, easy operation, and low price of the Intel ProShare Personal Conferencing Video System 200 make it appealing for anyone who wants to make person-to-person calls

SUITABILITY TO TASK

Intel ProShare Personal Conferencing Video System 200

	Power	Ease of Use
Video phone	Fair	EXCELLENT
Document conferencing	GOOD	EXCELLENT

The ProShare System 200's camera affords only two views: close-up and wide-angle. The included software lets you view both incoming and outgoing video in a 160- by 120-pixel or 320- by 240-pixel window; choosing the larger size sacrifices some image detail. The system's color accuracy is quite good, reproducing even flesh tones well, and the software allows you to adjust the brightness, contrast, saturation, and tint of the video images.

Intel's solid documentation makes the system easier to install than a sound board. The package includes two 16-bit ISA boards (a video digitizing board for the camera and an ISDN board with audio), a paperback-size camera that attaches to your monitor, a combination earphone/microphone, and Windows software. You can use any NTSC-compatible camera in place of the one provided; you can also hook up your own external speakers and microphone.

The bundled Windows-based software includes an on-screen dialer, a speed dialer, and a full address book that lets you paste in snapshots of callers. The built-in whiteboard lets you work on several different document pages concurrently, with a handy private space for tak-

ing personal notes. Intel ProShare Personal Conferencing Software is available alone for \$99 (see the article "Remote Possibilities" in this issue).

In its current incarnation, the whiteboard supports OLE but does not allow application sharing, a feature promised in the \$299 Premier edition of the software due this spring. Support for the H.320 compression standard, which would permit the Intel product to work with other videoconferencing systems, is

scheduled for later this year.

► **Intel ProShare Personal Conferencing Video System 200.** List price: \$2,499. Requires: 486/33-based PC or better, 8MB RAM, VGA, Microsoft Windows 3.1. Intel Corp., 2200 Mission College Blvd., P.O. Box 58119, Santa Clara, CA 95052-8119; 800-538-3373, 503-629-7354; fax, 800-525-3019.

Circle 452 on reader service card

InVision Systems Corp.

• InVision, Release 2.1.5

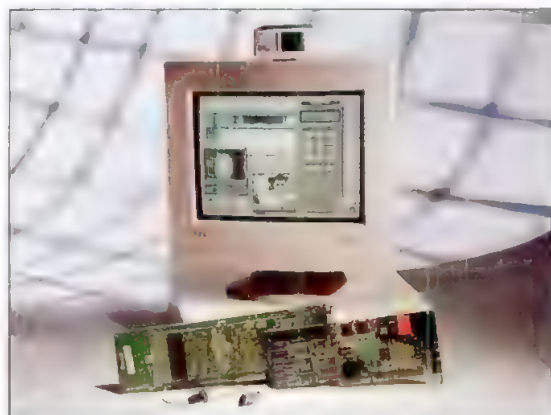
BY HOWARD ALEXANDER

InVision Systems Corp.'s InVision, Release 2.1.5, offers videoconferencing over nearly any high-speed medium, from ISDN lines to LANs and WANs. This software package has some rough edges but still makes a reasonable case for conferencing, especially over a network.

The videoconferencing software, which works with Intel's Action-Media II or Media Share's Mambo DVI card, normally lists for \$995 per user. We tested a complete configuration that included the Action-Media codec boards, handsets, and Howard Enterprises' TeleCamera for a total of \$3,165 per seat.

The InVision conferencing software is bundled with VisionGraphics, a relabeled version of Future Labs' whiteboard application TalkShow. We were unable to use the whiteboard software over our NetWare 3.12 Ethernet test network, and InVision Systems was unable to help us solve the problem. Installation was further complicated by a failed handset and a defective audio connector.

On the whole, the InVision software



The Intel ProShare System 200 has an easy-to-use interface, a wide range of image controls, and a shared whiteboard with space for private notes.

over ISDN lines. The ProShare System 200 lists for \$2,499 but is generally available for about half that price when ordered with ISDN service from a regional telephone company. Pacific Bell offers the system for only \$999.

The ProShare System 200 supplied between 8 and 15 frames per second of video on our tests. Outgoing video is compressed in hardware, using Intel's own Indeo codec; incoming video is decompressed in software by the CPU. Consequently, image quality depends largely on the PC you're using. On our tests, a 486DX2/66 system proved more than adequate.



InVision lets you adjust the video frame rate to control the amount of network traffic the system generates.

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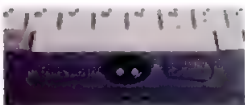
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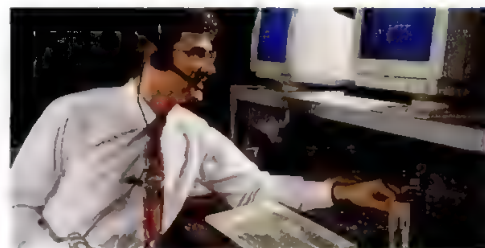


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- 5 16-bit ISA Slots
- 101-Key Keyboard & Mouse
- MS-DOS 6.21, Windows 3.11, & MS Works 3.0

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Austin P5-60 \$2,399

Lease \$95/mo*

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- 8 MB RAM, 256 KB L2 Cache
- 425 MB Hard Drive
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- 3.5" Diskette Drive
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- *PC World Best Buy

Austin P5-66 \$2,999**BEST VALUE** Lease \$119/mo*

- Intel 66 MHz Pentium Processor
- 16 MB RAM, 256 KB L2 Cache
- 540 MB Hard Drive
- PCI-Bus Windows Accelerator with 2 MB
- 3.5" Diskette Drive
- 15" NI SVGA Monitor
- 2 PCI, 1 PCI/ISA and 4 ISA Slots
- 101-Key Keyboard & Mouse
- MS-DOS 6.21, Windows 3.11 & MS Works 3.0

Austin Deskside P5-66 \$3,799

Lease \$131/mo*

- Intel 66 MHz Pentium Processor
- 16 MB RAM, 256 KB L2 Cache
- 540 MB Hard Drive
- PCI-Bus Windows Accelerator with 2 MB
- Double-Speed CD-ROM
- 3.5" Diskette Drive
- 17" NI SVGA Monitor
- Tower Case
- 2 PCI, 1 PCI/ISA and 4 ISA Slots
- 101-Key Keyboard & Mouse
- MS-DOS 6.21, Windows 3.11 & MS Works 3.0

Upgrade Options

Multimedia upgrade — MediaMagic 16-bit sound card, 2X Sony CD-ROM, Speakers, \$259; 15" NI SVGA Monitor, \$90

Austin DX4-75 Notebook

\$4,999 Lease \$199/mo*

- 8 MB RAM
- 524 MB hard drive
- TFT Active Color Display

Austin DX2-66 Notebook

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Desktop Videoconferencing

SUITABILITY TO TASK

InVision, Release 2.1.5

	Power	Ease of Use
Video phone	GOOD	FAIR
Document conferencing	N/A	N/A

N/A—Not applicable: InVision has N/A ratings because we were unable to test its document conferencing software over our network.

performed well, providing sharp, clear images with accurate color. Video ran at close to the claimed 20 frames per second at 256- by 240-pixel resolution. At that speed, the software uses 512 kilobits per second of network bandwidth; according to InVision Systems, you can reduce that to as little as 56 Kbps by manually slowing the frame rate. Audio was understandable but reminiscent of a noisy long-distance phone call; audio/video synchronization was close but not perfect.

The software includes a "visual address book," which lets you paste in an image grabbed from the incoming video, or save and compress grabs using JPEG.

► **InVision, Release 2.1.5.** List price: \$995. Requires: 386-based PC or better, 8MB RAM, VGA, Microsoft Windows 3.1, video capture board and video camera, 16-bit network adapter or modem. InVision Systems Corp., 8500 Leesburg Pike, #300, Vienna, VA 22182; 703-506-0094; fax, 703-506-0098.

Circle 453 on reader service card

MRA Associates Inc.

• VidCall, Version 5.44

BY STEVEN C.M. CHEN

MRA Associates' VidCall software, only \$99 for two users, is one of the least expensive ways to get started with videoconferencing. It's also one of the few packages that can work over a network or a fast modem link on a standard telephone line. But the package's features, documentation, and performance are all

SUITABILITY TO TASK

VidCall, Version 5.44

	Power	Ease of Use
Video phone	POOR	FAIR
Document conferencing	FAIR	FAIR

at the bottom of the spectrum.

To turn VidCall into a complete videoconferencing package, you'll need a video capture board (18 models are supported), a video camera, and any telephone (for audio). We used HLT's Micro Video video capture board and Howard Enterprises' TeleCamera for our testing, which brought the total price per user up to about \$720.

Since VidCall doesn't provide any hardware compression, smooth motion is out of the question. We were able to achieve less than 1 frame per second over a NetWare



The video quality of MRA's VidCall was limited by the 14.4-Kbps speed of modems running on a standard phone line.

3.12 Ethernet LAN and slightly more when communicating over standard phone lines with a 14.4-kilobit-per-second modem.

VidCall lets you see yourself in one window and the other party in another. By default, these windows measure about 1.25 by 1 inches; you can resize them at the expense of video quality. On tests, we were unable to read printing smaller than about 72 point, which is larger than the typical newspaper headline. Colors were untrue to the originals and tended to bloom.

You can place a video call either by using the quick-call feature—simply dial the number on an on-screen keypad—or with the phone book. To add audio communications, you have to call the other party on the telephone. With a voice/data modem, sold by third-party vendors for about \$1,000, you can use a single line.

VidCall's whiteboard, called WorkSpace, limits data sharing

to still images imported via the Windows Clipboard. If you already own the needed hardware and want only to exchange images, then VidCall offers an inexpensive opportunity to try videoconferencing. Otherwise, it has little appeal.

► **VidCall, Version 5.44.** List price: For 2 users, \$99. Requires: 486-based PC, 4MB RAM, high-color graphics, Microsoft Windows 3.1, video capture board and video camera, network adapter or modem. MRA Associates Inc., 2102B Gallows Rd., Vienna, VA 22182; 703-448-5373; fax, 703-734-9825.

Circle 544 on reader service card

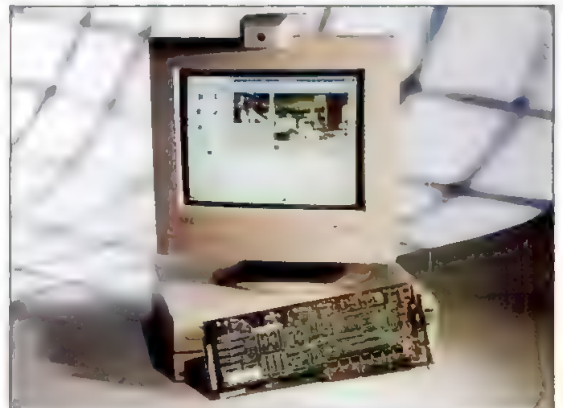
Northern Telecom Inc.

• Visit Video, Version 2.0

BY STEVEN C.M. CHEN

The biggest strengths of Northern Telecom's Visit Video videoconferencing system are its cross-platform compatibility (a Macintosh version is available) and its ability to integrate tightly with Northern Telecom Meridian PBXes—features that may appeal to midsize and large businesses with mixed computing environments. The package works over either ISDN or Switched 56 lines and is available in both color and monochrome (gray-scale) versions. The version we tested, which supports color imaging over ISDN, costs \$5,319 per seat; all versions of the product require a separate line to carry audio.

Although Visit's motion video is acceptable, running at up to 15 frames per second, the displayed image lags by as much as a second. Some shift in colors was noticeable, too, although generally image quality was fair.



Visit Video lets you see yourself and the party you've called, but you can't resize the video windows.

SUMMARY OF FEATURES

Desktop Videoconferencing



Products listed in alphabetical order by company

■ = YES □ = NO

List price (for specified number of nodes)

Hardware Included

Total number of boards per system

PC bus types supported

Codec/ISDN adapter

Video camera

Microphone

Operational Features

Maximum resolution for video frames

Frames per second at maximum resolution over specified medium (claimed)

Supports H.320

Simultaneous display of incoming and outgoing video

Maximum number of multipoint users

Versions available to run video on:

Ethernet/Fast Ethernet

4-Mbps/16-Mbps Token-Ring

FDDI

ISDN/Analog telephone line

Leased line/Switched 56 line

T1/Fractional T1

Requires separate analog telephone line for audio transmission

Software Features

Software name and version

Whiteboard/Shared clipboard

Real-time application sharing

Application links

Call logging/Chat

Captures and transmits still image

Video mail/Audio mail

Service and Support

Hardware warranty

BBS/Toll-free technical support

Technical support hours (eastern time)

	AT&T Global Information Solutions AT&T Telemedia Personal Video System \$4,995 (1)	Intel Corp. Intel ProShare Personal Conferencing Video System 200 \$2,499 (1)	InVision Systems Corp. InVision, Release 2.1.5 \$995 (1)	MRA Associates Inc. VidCall, Version 5.44 \$99 (2)	Northern Telecom Inc. Visit Video, Version 2.0 \$5,319 (1)	PictureTel Corp. PictureTel Live PCS 100 \$5,995 (1)	Speccom Technologies Corp. Piccon System \$2,995 (2)
Hardware Included							
Total number of boards per system	2	2	N/A ●	N/A ●	1	2	3
PC bus types supported	ISA, EISA	ISA, EISA	N/A ●	N/A ●	ISA, EISA	ISA, EISA	ISA, EISA
Codec/ISDN adapter	■	■	■	■	■	■	■
Video camera	■	■	Optional (\$420-\$595)	■	■	■	■
Microphone	■	■	■	■	■	■	■
Operational Features							
Maximum resolution for video frames	352 x 240	320 x 240	256 x 240	280 x 210	176 x 144	352 x 288	320 x 240
Frames per second at maximum resolution over specified medium (claimed)	15 (ISDN)	16 (ISDN)	20 (Ethernet LAN)	0.4 (analog telephone line)	15 (ISDN)	15 (ISDN)	1 (analog telephone line)
Supports H.320	■	■	■	■	■	■	■
Simultaneous display of incoming and outgoing video	■	■	■	■	■	■	■
Maximum number of multipoint users	24	N/A ●	N/A ●	10	N/A ●	16	N/A ●
Versions available to run video on:							
Ethernet/Fast Ethernet	■	■	■	■	■	■	■
4-Mbps/16-Mbps Token-Ring	■	■	■	■	■	■	■
FDDI	■	■	■	■	■	■	■
ISDN/Analog telephone line	■	■	■	■	■	■	■
Leased line/Switched 56 line	■	■	■	■	■	■	■
T1/Fractional T1	■	■	■	■	■	■	■
Requires separate analog telephone line for audio transmission	■	■	■	■	■	■	■
Software Features							
Software name and version	Telemedia Connection 1.01.01	Intel ProShare Personal Conferencing Software 1.5	InVision 2.1.6	VidCall 5.44	Visit Video 2.0	PictureTel Live 1.0	Piccon 1.0
Whiteboard/Shared clipboard	■	■	■	■	■	■	■
Real-time application sharing	■	■	■	■	■	■	■
Application links	None	OLE	OLE, DDE	None	None	DDE	None
Call logging/Chat	■	■	■	■	■	■	■
Captures and transmits still image	■	■	■	■	■	■	■
Video mail/Audio mail	■	■	■	■	■	■	■
Service and Support							
Hardware warranty	3 years	3 years; 1 year on earpiece, camera	N/A ●	N/A ●	1 year	1 year	1 year
BBS/Toll-free technical support	■	■	■	■	■	■	■
Technical support hours (eastern time)	24 hours, 7 days a week	11:00-8:00 M-F	9:00-6:00 M-F	8:00-5:00 M-F	8:00-8:00 M-F	9:00-5:00 M-F	12:00-10:00 M-F

* Audio mail is handled via conventional voice mail over analog telephone lines

N/A ●—Not applicable: This product consists of software only.

N/A ●—Not applicable: This product does not offer multipoint communications.

Starting a videoconference with Visit requires two calls (one for video, one for voice), but the program's address book lets you store both numbers. If you have a Northern Telecom Meridian PBX system, you can use a connector (no additional charge) to hook your phone to your PC's serial port, and Visit will make both calls.

Visit's whiteboard software, called ScreenShare, provides a standard set of markup tools and handles a variety of graphics formats including .BGA, .BMP, .EPS, .GIF, .PCT, .PCX, .TIFF, and .WMF. There's no provision for sharing applications, although you can send files

back and forth.

The Visit system includes everything you need to set up a videoconferencing station: a full-length video capture board, an M5000TD-1 ISDN terminal adapter, a Northern Telecom NT-1 network terminator, and a video camera. Installing the Visit system in our labs took more time

than most, partly because we had to reprogram our Northern Telecom PBX system. We also had to use a DOS-based utility to program the ISDN terminal adapter. Once initial installation was complete, though, Visit was easy to use and provided adequate though not extraordinary videoconferencing capabilities.

► **Visit Video, Version 2.0.** List price: \$5,319. Requires: 386-based PC or better, 8MB RAM, VGA, Microsoft Windows 3.1. Northern Telecom Inc., 2221 Lakeside Blvd., Richardson, TX 75082; 800-667-8437; fax, 214-684-3866.

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SUITABILITY TO TASK

Visit Video, Version 2.0

	Power	Ease of Use
Video phone	FAIR	GOOD
Document conferencing	GOOD	GOOD

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CIRCLE 062 ON READER SERVICE CARD

Making the Connection

By Frank J. Derfler, Jr.

While your video focus is on the desktop, you can't ignore the links in between. Monthly bills for desktop videoconferencing can add up to thousands of dollars, so they demand as much attention in your planning as the cost of the equipment itself. Today, the connection of choice for video links is the Integrated Services Digital Network (ISDN), although alternatives such as leased telephone lines may be more appropriate for heavy videoconferencing.

ISDN, a switched digital service, works a lot like today's voice telephone service, only faster. The desktop hardware sends connection commands over a separate channel to the local telephone company's switching center. In milliseconds, the switching center establishes a link of two 64-kilobit-per-second digital channels between the calling and called points.

ISDN has two advantages: it's fully digital (so it doesn't require analog modems), and it lets you can call anywhere there is service. ISDN availability, however, is still spotty in the United States and Canada. Worse, sales and support staff at many companies are not trained in ISDN.

A few large videoconferencing-equipment vendors, like Intel and Northern Telecom, have been working with telephone companies to simplify ordering ISDN service. Ideally, you should be able to tell the local telephone company what equipment you want to use, and its staff would know what ISDN features you require or would call the vendor of your equipment to find out.

In many parts in North America, ISDN is available on all of the telephone lines, but there are some strange service voids. Within Manhattan, for example, the difficulty of upgrading cabling under the streets to meet ISDN standards has made it

hard to get service. In parts of nearby Connecticut the circuits are available, but tariff arrangements aren't in place to deliver the service to residences. By contrast, it's relatively easy to get ISDN in many rural areas with modern telephone equipment.

As with voice telephone lines, ISDN carries a charge for installation, a monthly fee for service, and a fee for calls outside of a specified area. The

The connection of choice for video links is the Integrated Services Digital Network (ISDN), although leased telephone lines may be appropriate for heavy users.

installation fees vary widely, but \$100 per line is typical. Monthly fees vary by telephone company and state; according to the Center for Communications Management Information, a rate-and-tariff consulting group in Rockville, Maryland, monthly rates typically range from \$22 to \$26 per line. Local calls may not carry additional charges, but calls beyond 70 miles often run about 40 cents for the initial minute (or fraction thereof) and 30 cents for every additional minute.

LEASED LINES

If you can't get ISDN service, or if your company uses long-distance videoconferencing so heavily that the per-minute ISDN charges are a major portion of the operating budget, consider leasing dedicated services from a long-distance carrier. Leased lines carry a flat monthly rate for a full-time circuit between two points:

You pay the same rate whether you send data constantly or rarely. Generally, such lines offer a cost advantage if they're in use more than 6 hours a day. For example, two leased 64-Kbps lines—the equivalent of ISDN service—between Chicago and Los Angeles would cost about \$2,200 a month. ISDN, at 30 cents a minute, would add up to the same amount after about 120 hours.

The drawback of leased lines is that you can connect only between the same endpoints. But if you attach the leased lines to your corporate PBX, you can use the channels for data and voice calls on an as-needed basis, thus saving money on traditional long-distance service.

As your bandwidth requirements increase, leased lines become more and more economical. Twenty-four point-to-point 64-Kbps channels—a package the industry calls T1 service—would cost roughly \$10,000 per month. Some carriers offer fractional T1 service, which lets you order dedicated lines that run at, for instance, 128 or 256 Kbps.

ALTERNATIVE CONNECTIONS

Some videoconferencing products also work over Switched 56 lines—digital lines installed between your premises and the telephone company's central office. Switched 56 service derives its name from its 56-Kbps speed and "switched," or dial-up, nature: it lets you call other Switched 56 numbers and quickly set up a fully digital connection.

In the future, multipoint video networks are likely to migrate toward a service called asynchronous transfer mode (ATM), an outgrowth of ISDN that offers faster signaling. That future is a way off, though: Both ATM products and practical nonproprietary standards for multipoint video are still under development. □

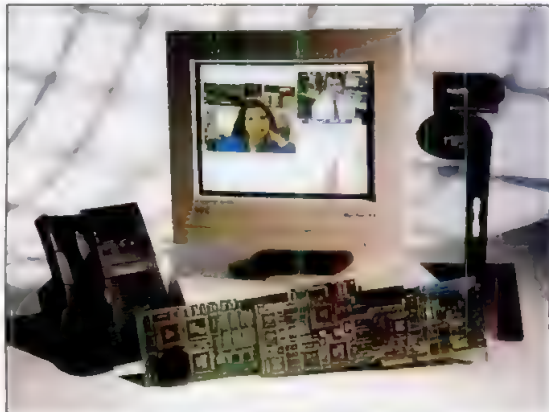
Desktop Videoconferencing

PictureTel Corp.

PictureTel Live PCS 100

BY STEVEN C.M. CHEN

If high-quality video is the criterion driving your videoconferencing selection, the PictureTel Live PCS 100 is the product to consider first. The PCS 100 had the best video quality of any system we tested, but at \$5,995 per station, it was also the most expensive.



The PictureTel Live PCS 100 had the best video quality of any system we tested.

The PCS 100, which works over ISDN lines, supports a maximum of 15 frames per second, which translates into reasonably smooth motion. Image quality is excellent, and the caller looks sharp and clear. The PCS 100 reproduces color, even flesh tones, with impressive accuracy.

The included FlipCam camera has enough wide-angle coverage for two people to sit comfortably in front of it to demonstrate a product. Zoom, focus, and brightness controls are manual; the camera's stand lets you change the camera's position with a simple flip of a knob. The system can also accept video input from two additional sources. Audio is sent over the same line as video, using an included speaker phone.

The PictureTel Live software lets you place a call from the built-in phone book or

manually, using an on-screen dial pad. The included whiteboard, called Clipboard, lets you share a working area with your caller and includes a standard set of markup tools. You can't use Clipboard to share your Windows desktop or to run applications; it only lets you manipulate static images and transfer files. Video capture was not supported in the Version 1.0 software we tested but will be included in Version 1.1.

The PCS 100 is compatible with the CIF H.320 standard, so you can communicate with more expensive conference-room systems from PictureTel and other manufacturers. It supports both FCIF (352-by-288-pixel) and QCIF (176-by-144-pixel) image resolution.

Clearly written and well-illustrated manuals make installation easy. The system is based around two full-length ISA or EISA boards: an SVGA video board, which supports 256 colors at 1,024-by-768 resolution and performs video compression, and an Audio Communication Board, which handles audio compression, echo cancellation, and ISDN support. Once the PCS 100 is hooked up, built-in diagnostics will tell you whether everything is functioning properly.

► **PictureTel Live PCS 100.** List price: \$5,995. Requires: 386-based PC or better, 4MB RAM (8MB recommended), Microsoft Windows 3.1. PictureTel Corp., The Tower at Northwoods, 222 Rosewood Dr., Danvers, MA 01923; 800-716-6000, 508-762-5000; fax, 508-762-5245.

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Specom Technologies Corp.

Picfon System

BY STEVEN C.M. CHEN

Specom Technologies Corp.'s Picfon System, \$2,995 for two nodes (excluding cameras), is a DOS-based videoconferencing system that works over ordinary phone lines. Picfon provides a fuzzy still image of the person you are calling but falls short of offering full-motion video or document-sharing capabilities.

The Picfon package includes a 14.4-kilobit-per-second fax modem/audio/voice codec board with handset, a high-

color VGA adapter, and a video capture board; to complete the system, you'll need to supply your own cameras. We used cameras from Sharp Electronics Corp., for a total price of about \$1,850 per user.

Given the relatively low speed of the modem connection, it's not surprising that the Picfon's video performance and quality were poor. Even with a small monochrome image, we got no more than one frame per second in our tests. But what was more frustrating was the system's 15-second time lag, which made it difficult to detect emotional reactions.

The video window can be set to one of three sizes—including full-screen—but it

SUITABILITY TO TASK

	Picfon System	
	Power	Ease of Use
Video phone	POOR	POOR
Document conferencing	N/A	N/A

N/A—Not applicable: Picfon System has N/A ratings because it does not come with document conferencing software.

lacks detail. Colors are reproduced poorly and tend to bloom. Voice quality is only fair, too, since audio is multiplexed over the same modem connection as video.

When you make a call, the Picfon initiates a voice-only connection; then, after manually loading the videoconferencing modules, both parties must press a key within 3 seconds of each other. The software's data-sharing features are limited to sending a still image across the line; there is no shared whiteboard, although one can be added via third-party software packages such as Future Labs' \$199 TalkShow and Intel's \$99 ProShare. Specom says that its new MediaShare TeleCommunicator product, which shipped too late for testing, provides integrated whiteboard capabilities and an improved, Windows-based interface.

The possibility of holding a videoconference over a standard phone line is appealing, but the Picfon only illustrates the limitations of the medium. □

► **Picfon System.** List price: For 2 users, \$2,995. Sharp Electronics NCK9127C video camera, \$350. Requires: 386-based PC or better, 4MB RAM, 40MB hard disk, video camera, DOS 5.0. Specom Technologies Corp., 2322 Walsh Ave., Santa Clara, CA 95051; 408-982-1880; fax, 408-982-1883.

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SUITABILITY TO TASK

PictureTel Live PCS 100

	PictureTel Live PCS 100	
	Power	Ease of Use
Video phone	EXCELLENT	EXCELLENT
Document conferencing	GOOD	GOOD

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Multitasking	YES	NO
Memory management	YES	YES
Protected mode drivers	YES	NO
Workstation security	YES	NO
Backup & Antivirus	YES	YES
Built-in networking	YES	NO

*MS-DOS is a registered trademark of Microsoft Corporation

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Workflow Automation Software

Go. with the Flow

Tools that make our businesses more competitive have a powerful lure. Will today's "second-generation" workflow software change your office for the better? *By Michael A. Bragen*

Just after the turn of this century, industry took a great leap forward with the invention of the assembly line. Mechanical processes that had previously depended solely on an individual's level of skill and experience were analyzed, codified, and automated on the factory floor. Product consistency and quality improved, as did productivity and profits. Today, as we near the millennium, a parallel is emerging in the automation of knowledge-based business processes. A new electronic technology—workflow automation—is being applied to manage complex, interlocking tasks and the information they utilize and generate.

For the purposes of automation, knowledge-based business processes can be defined as sets of rules and way points that define and control the flow of information. Early on in computing, unifunctional automation was the norm; applications were focused on au-

tomating discrete business tasks. Clerical departments adapted to word processors; accounting departments acquired payroll and invoicing systems. Today, systems tend to be more broadly focused. Cross-functional automation, with information flowing from one business area to another, is rapidly becoming the norm: The whole thrust of computing has shifted toward connecting people and their knowledge.

MANUFACTURING METAPHOR

Early automated workflow systems evolved in a way reminiscent of the development of automated process control (APC) software (a precursor to computer-aided manufacturing systems). Pio-

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neered in the early 1970s, APC attempted to mimic the physical actions of a factory worker—encoding the movements necessary to tighten a bolt, for example.

In much the same way, the first attempts at building workflow systems used an imitative model for applying automation to business processes. Simply “electronicizing” physical systems can produce some improvements, but more benefits arise when the technology is used in a strategic way: Changing the process to take advantage of automation is generally more effective than applying rote automation to the process. Take simple document production, for example: Fifteen years ago, it was standard practice for an executive to dictate letters to a secretary, mark up the hard copies, and resubmit them for retyping. In the early days of word processing, the same iterative hand-off process took place, although the secretary probably saved time by electronically printing the revisions rather than physically retyping them. Today, most professionals use word processors interactively—creating, editing, and revising a document before it ever touches paper.

The first workflow products were closely associated with the document-imaging systems that appeared on the scene in the early 1980s—systems for cataloging, managing, and annotating electronic images of paper documents. In the



- **Delrina FormFlow**
- **Keyfile Enterprise Edition**

Picking an Editors' Choice in this product category is a lot like picking a mate. Beyond looking for certain basic qualities that almost everybody looks for (an attractive exterior, a strong constitution), finding the right fit

is a very individual matter—and even the most careful choice may well, over the long haul, lead to some irritating incompatibilities.

Expectations and requirements for a workflow product (as for a mate) vary widely. Our story covers a range that falls toward the lower end of the total spectrum of power, flexibility, and scalability, and forms packages stand at the lower end of that range. But to businesses looking to automate (primarily) linear flows that deal (primarily) with structured data, they offer much in re-

turn for a relatively minor investment in cash and effort.

Of the forms packages currently shipping, Delrina FormFlow, Version 1.0, offers the most: It's exceptionally easy to learn and use, it has a true development language (although its syntax could be richer), and it works with all the current mail APIs.

Keyfile Enterprise Edition, Version 2.2, ups the ante significantly in terms of overall workgroup functionality. While this product is not well adapted to highly complex workflow scenarios or to

mid-1980s, “image-enabled” workflow products (mostly Unix-based) from Digital Equipment Corp., FileNet Corp., IBM Corp., and Wang Laboratories, among others, made their first appearance. The main thrust of these first-generation workflow systems was to enable electronic flow of digitized documents from one processing step to the next. This meant an improvement in the speed of

document movement—roughly analogous to electronic printing versus physical retyping.

WORKFLOW-THINK TODAY

Workflow is still primarily concerned with moving and managing information, but the focus has now shifted from images to structured and text-based information. In the past two years, there has been a virtu-

HIGHLIGHTS

Workflow Automation Software

WORKFLOW AUTOMATION systems are the assembly lines of the electronic information age. Using your existing LAN infrastructure, they employ rules-based logic to systemize and speed up your business processes, moving and coordinating data within the workgroup. Workflow systems can manage structured and text-based data—contained in forms or in formatted editable documents—as well as images.

OFF-THE-SHELF workflow functionality, found in several packages in

this roundup, serves organizations with simple, predictable work patterns. These packages provide graphical interfaces and tools, and they enable users with little programming experience to build and operate efficient workflow systems.

COMPLEXITIES—intricate workflow logic, links to outside systems, and extensive exception processing—are the province of customizable workflow systems. See coverage of such packages in the sidebar “High-End Workflow.”

EASE OF USE is an emerging trend. Vendors are providing graphical-analysis, job-definition, and process-monitoring tools that simplify development for both professionals and nonspecialists.

OBJECT-ORIENTED techniques are on the rise. You can create intricate workflows by using object libraries and by encapsulating, or nesting, workflow procedures as objects inside other larger objects. Object-based systems can be expanded with minimal risk and investment.

widely distributed or multiserver workgroup infrastructures, astute end users can easily create solid workflow applications—replete with conditional branching—using its basic tools. Keyfile's KOALA scripting language—or the power of third-party programming applications like Visual Basic or Power Builder—can be brought to bear for further automation or customization needs.

Keyfile's document management capabilities constitute a giant bonus for workflow adopters. The package smoothly integrates faxing, scanning, and optical storage, harnesses the editorial and document-creation powers of most DOS and Windows applications, and provides a “portable” (TIFF-based) document format (that is, a format that all users can read and annotate without recourse to the originating application). Finally, the product avoids straining network bandwidth by moving pointers, not files, around the work-

group. Our two main quibbles with Keyfile are its high price and the proprietary (closed) nature of its transport and connectivity architecture.

Of the products we tested, ActionWorkflow Manager, Version 1.01, is perhaps the best adapted to industrial-strength, process-oriented workflow needs, and we give it honorable mention. A few caveats: To live comfortably with ActionWorkflow, you'll have to buy into its highly structured analysis and design methodology; this can be an asset or a liability, depending on the nature of your workflow. Further, you can't modify or improve a workflow once it's in place; rather, you'll have to build a new workflow when you want to make changes. (Still, once you've done the design, the package builds the database infrastructure that you need to manage the flow of work.) With the Notes version (the one we tested), the data content of your applications resides in a single database,

which becomes more fragile as it fills. Finally, ActionWorkflow is expensive, especially with the cost of the Lotus Notes or SQL Server engines on top of which it runs.

Lotus Notes itself earns honorable mention here. Notes' performance on our tests was impressive. When used by expert and dedicated hands, Notes can provide substantial workflow automation without help from ActionWorkflow or any of the many available workflow-oriented add-ons. Notes' security mechanisms and its version management are particularly noteworthy. Its links to certain Windows applications, especially via OLE and other integration techniques, add value in dealing with rich documents. Considering how many businesses have Notes installations up and running (and have the concomitant development expertise), these and other advantages should be solid food for thought in many organizations.

al explosion of new products across a wide spectrum of price and functionality—ranging from inexpensive (hundreds of dollars) to very expensive (hundreds of thousands of dollars) and from simple to complex. Traditional shorthand thinking tends to categorize these packages as low-end and high-end.

Systems can be characterized—low-end versus high-end—across two dimensions: extent of routing capability and breadth of enterprise scalability. Basic e-mail—point-to-point messaging between two users—represents the low watermark along the routing dimension. Low-end workflow packages (generally systems that perform automated routing) add at least one layer of complexity, which may take the form of sequential routing (when the information follows a predetermined, serial path), conditional branching based on user input, parallel routing (concurrent “broadcasts” to several individuals or a common pool of workers), or all three.

Often termed *ad hoc* workflow packages to signify their capability for flexible, almost spontaneous routing, these systems range roughly in price from \$100 to \$800 per “seat,” or user.

High-end systems (at least in the traditional sense) take conditional routing a

step or two farther. By supporting rich macros and language-based feature sets, systems can be configured to handle more complex routing of information—which may encompass “exceptions” (errors and other unexpected or nonstandard inputs), complex logical or mathematical algorithms, or logic drawn from external systems—and sophisticated analysis and reporting functions. As a result, these systems tend to be more production oriented, enabling simultaneous, enterprise-wide use or high-volume processing, sometimes running into millions of transactions per month. Costs for such systems range from \$200 to \$10,000 per workstation. For more details on production-oriented products, see the sidebar “High-End Workflow.”

The enterprise-scalability dimension—basically describing an application's scope—is governed by the number

of individuals or workgroups that can use the system, the extent of LAN or WAN connectivity, and the level of support for different hardware and software platforms. While the more costly and sophisticated workflow products maintain an advantage here, that advantage is ebbing away. In fact, the most significant issue related to the high-end versus low-end argument may be the erosion of differentiation between them. Through evolving features such as improved LAN and WAN support, the more advanced low-end applications are clearly crossing into high-end territory.

WORKFLOW USAGE

Traditional (first-generation) workflow, with its emphasis on routing and indexing of document images, focused on a relatively narrow band of industry applications. This was determined largely by cost,

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Suitability to Task: Workflow Automation Software

Workflow packages bring sometimes complex, often powerful abilities to the desktop. Through design, routing, rules, security, and tracking features, they let the administrator, developer, and end user customize and speed up the time-consuming tasks that are a regular part of the daily grind.

To help us unravel the complexities of these packages, we asked all of the vendors to participate in our testing process. Their participation was especially helpful since many of these products take considerable periods of time to install and set up. We were able to have the vendors work with our reviewers for a portion of the test period, assisting them and answering queries. Vendor participation also allowed us to mirror the experience of most workgroups that purchase these packages. Many of these products are typically purchased via value-added resellers or directly from the vendor, and they usually include support (installation help and training) as part of the sale.

The tested workflow products vary greatly. We looked at packages with different feature sets and emphases—Lotus Notes and forms packages as well as dedicated workflow software. Still, since all 11 offerings are aimed at accomplishing similar tasks—including the organization and tracking of workflow processes—we used the same solution-based script for all of the products and ran each one through the following two scenarios.

The first, our Form-Processing scenario, involved the approval of a college financial-aid application. We used what is essentially a paper-based process (moved to an electronic forum) to evaluate and approve such an application. Our goal was to automate the flow of data across the college in a systematic manner. Conditional routing—in which the actual direction of a workflow is determined by the data in the flow—was a part of this procedure. We also tested each product's ability to track and report on the current status of the process, in its entirety or in part.

Our Collaborative-Document scenario involved a company—a distributor—employing several people needing to collaborate on different portions of a bid. We set out to automate the process of consolidating the pieces used in preparing bids and to develop a system to keep track of different versions of the entire bid, as well as pieces of it. We also wanted users to

be able to route the flow as needs dictated. Our objective was to generate a bid as quickly as possible.

We rated the installation and setup of these packages, and evaluated their performance in terms of the remaining three tasks as we ran them through the scenarios. As with all Suitability to Task ratings for software, we rated the products for both power and ease. The former rating represents the depth of features a product has, and the latter represents the ease with which we were able to use those features. The first part of our testing involves **installation and setup** of each program, as well as of any additional required tools. While the number of these tools varies greatly, we did not see a correlation between depth of features and complexity of setup. We look at the types of networks each product supports, as well as at the additional hardware and software requirements for each server. We look at how much the application is able to use existing information—such as a

user list from a NOS package or an e-mail package, or existing security assignments—and what types of links or gateways can be used to extend the workgroups further.

We look at the storage methods the packages use for both user data and workflow design. We look how easy it is to create a front end to the underlying workflow and whether the client needs additional software in order to be part of the workflow. We also rate the ability to integrate the use of various hardware devices (such as scanners, fax modems, and printers) into an application. We consider whether data can be spread out across multiple servers and whether the mechanics of the flow (the server and pathname, for example) can be made invisible to the user. We also look at whether data is actually moved around or if pointers to the data are moved instead.

The most significant portion of testing involves actual **workflow creation**. We look at workflow-design and workflow-administration tools. In many of these products, design and administrative tools are to be used only by experienced developers and support technicians—with some products being enhanced by value-added resellers. We rate the level of accessibility of a package's design tools, looking at whether they would be usable by an average end user, a power user, or only a programmer. We also rate a package's ability to provide an administrator with

control over creating and maintaining workflows, and whether this ability is flexible enough to allow user control as well as administrator control. Where applicable, we look at the strength of the tools provided for creating forms, rating how well a program emulates and enhances a process that already exists in paper form. We also look at a program's ability to create easy-to-use front ends, including help files.

We look at the ability to design and display a workflow graphically. We also look at the tools available for testing prior to distribution. We rate a package's ability to create workflows based on individuals as well as roles, to deal with exceptions within a workflow, and to reroute information dynamically as needed.

We pay particular attention to routing capability. We look at the types of routing options that are offered—including parallel, conditional, and infinite loops—and

evaluate flexibility. With conditional routing, we look at the types of conditions that generate actions, and what types of actions could be performed based on these conditions.

We also evaluate a package's ability to distribute and control workflows. We rate how well a program deals with modifications to workflows in progress (and the data in those workflows).

One of the many benefits of having an automated workflow is the ability to keep track of individual and group processes and generate reports on work in progress and on the data actually being processed. In **tracking and reporting**, we look at a program's ability to give information on each process, including current location in a workflow and status at that location. We also rate a package's ability to keep a log of each step in a workflow so that a user can evaluate the workflow—or workflows—as well as the individuals and groups involved. We also look at the ability to provide data relevant to improving a workflow.

Rather than changing the way you work, a good workflow package should integrate itself into the way you already work. In particular, it should allow you to use the tools you are comfortable with. To evaluate **integration**, we look at a package's ability to coexist with and even utilize existing desktop applications and tools.

SUITABILITY TO TASK		
	Power	Ease of Use
Installation and setup	EXCELLENT	POOR
Workflow creation	GOOD	FAIR
Tracking and reporting	FAIR	GOOD
Integration	POOR	EXCELLENT

as—generally—only large financial institutions and insurance companies could afford systems costing several thousand dollars per seat. With the upsurge in low-cost “second-generation” workflow solutions, however, the audience has broadened.

Statistics compiled in a February 1994 survey indicate ways in which various industries are actually using workflow automation. The accompanying pie chart shows a breakdown of business applications used. Financial applications, such as loan processing and various accounting approval processes, accounted for the largest concentration of responses, followed closely by customer-service applications (which comprise insurance functions such as claims). Together with administrative applications such as human resources and clerical support systems, these made up more than three-quarters of the applications reported.

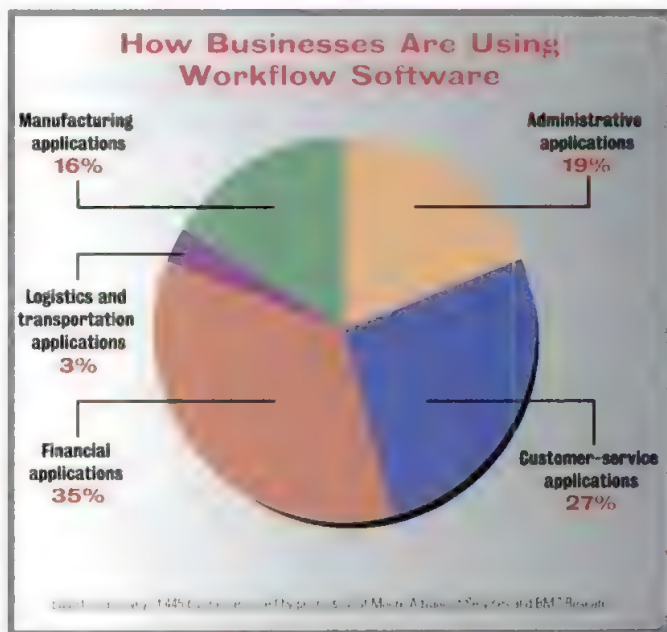
More recently, however, as the cost of workflow products has started to drop (and their accessibility to increase), the tightly focused market described in the pie chart has begun to give way to a much greater diversity of workflow applications—evidenced by the more than 45 kinds of applications listed in the survey’s “other” category (not tabulated in the chart).

SELLING BUILDING BLOCKS

In essence, workflow software provides a toolkit for building applications; work-

flow is not itself an application type. Thus, the problem with building a market in toolkits is that the audience is traditionally made up of the relatively small population of builders and core-enterprise data managers, not the relatively large population of end users.

This emerging market reality has led to a shift in the way workflow products are designed and positioned. The new breed of workflow toolkits not only targets professional application builders; it caters to nontechnical end users as well. This is achieved through the addition of easy-to-use graphical interfaces, which often involve “push-button” design capability to let a wide range of “developers” (from novices to experienced professionals) build workflow systems quickly with minimal effort. On one hand, this dramatically expands the base of potential customers for these products. On the other, it significantly enhances the productivity of professional developers by shortening development life cycles—particularly in the internal de-



sign and coding phases. The concept of rapid prototyping takes on new meaning when working applications can be built in a matter of hours instead of weeks.

OUR STORY

PC Magazine tested six second-generation workflow products that on the one hand have a low-end or ad hoc market image but which also reflect the recent trend toward combining power with an end user orientation and ease of use: ActionWorkflow Manager (Action Technologies), Archive Lite (JCST), IBM ImagePlus/2 (IBM Corp.), Keyfile Enterprise Edition (Keyfile Corp.), Office.IQ (Portfolio Technologies), and WorkMAN (Reach Software Corp.). We also tested Lotus Notes (Lotus Development Corp.), the archetypal PC-based groupware package, and four electronic forms packages that embody an ever-increasing focus on automated work routing and process design: BeyondMail Forms Designer (Banyan Systems), Delrina FormFlow (Delrina Corp.), Microsoft Electronic Forms Designer (Microsoft Corp.), and WordPerfect InForms (WordPerfect Corp.). A fifth forms package, JetForm (JetForm Corp.), was in beta during our testing; we preview it in a sidebar.

Our reviews are based on testing involving two relatively simple workflow scenarios. The first, the Form-Processing scenario, entailed the processing of a college financial-aid application, which

Workflow Data Handling

For a workflow package to suit your workgroup, it must be adept at handling the data types you use—images, forms, or editable documents, or perhaps all three. Rather than rating the quality of the packages’ data handling, we note how each product handles each data type: either natively (if you can create or edit the data without going outside the package), via file attachments (as with e-mail), or via object embedding. We also show which products can use all three methods.

	Images	Forms	Editable documents
ActionWorkflow Manager	All	Native	All
Archive Lite	Embedding	Embedding	Embedding
BeyondMail Forms Designer	Attachment	Native	Attachment
Delrina FormFlow	Attachment	Native	Attachment
IBM ImagePlus/2	Native	N/A	N/A
JetForm	Attachment	Native	Attachment
Keyfile	Native	Native	Native
Lotus Notes	All	Native	All
Microsoft Electronic Forms Designer	Attachment	Native	Attachment
Office IQ	Attachment	Native	Embedding
WordPerfect InForms	Attachment	Native	Attachment
WorkMAN	Attachment	Native	Attachment

N/A—Not applicable. IBM ImagePlus/2 handles only images.



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SOFTWARE FOR DOCUMENT AND WORK MANAGEMENT



Workflow Automation Software

moved in linear fashion through several review and approval steps, each of which included a conditional branch. For example, if an applicant was financially eligible (to be determined by the person performing this review setup), the application was sent on for faculty review; if not, a rejection letter was generated. We also tested each product's ability to track and report on the current status of the process, in its entirety or in part.

Each product was tested for its ability to manage a workflow using design tools, routing, and data handling. All reviewed packages were able to handle the scenario adequately, but several—ActionWorkflow, Keyfile, Lotus Notes, Office.IQ, and WorkMAN—far exceeded our requirements.

In our second test, the Collaborative Document scenario, several people were to submit elements of a job bid that was centrally consolidated, designed, edited, and approved. The flow dynamics included recursive loops (in which elements moved back and forth between two workers in an iterative revision and approval process), as well as ad hoc (unstructured) and parallel routing. We also tested version tracking—of individual elements and of the whole bid proposal.

Fewer products were equipped to address this scenario effectively. While most of the packages could deal with the notification and ad hoc facets of the task, only Lotus Notes and ActionWorkflow (we tested the version that uses the Notes engine) were able to handle adequately both the versioning and circular workflow routing of all the document's components.

IMPENDING ISSUES

Where is the workflow market headed? From the technical perspective, the next major hurdle involves the open systems question—particularly for any large organization with a broad range of hardware and software platforms. From a conceptual perspective, on the other hand, corporate practice needs time to catch up to the technical capabilities already available. With the emergence of more powerful, less time-consuming ways of generating workflow applications, organizations experienced with workflow will want to investigate ways of

off-loading project backlogs onto user departments. And groups new to workflow will want to develop ways of using these tools to derive enough benefits to justify the cost and effort involved in acquiring and implementing them.

In either case, organizations must establish coherent plans for structuring applications before automation begins. Workflow automation lies at the heart of the trend toward "process reengineering" as a way of increasing competitive efficiency in today's business climate. To take strategic advantage of automation, businesses must reevaluate and reorganize *the way in which* information is shared and routed. While software and hardware can help, improving workgroup efficiency remains the primary task of human beings.

Action Technologies Inc.

● ActionWorkflow Manager

BY JOHN HELLIWELL

Action Technologies' ActionWorkflow Manager, Version 1.01, not only aids in the construction and administration of workflows; it is the only product reviewed here that also provides tools for analyzing the workflow process.

Given the highly structured nature of its design methodology, using it to build projects of modest scope may prove akin to using a mainframe to balance your checkbook. For automating many business processes, however, especially the more complex ones, the tools provided by ActionWorkflow may be just what you need.

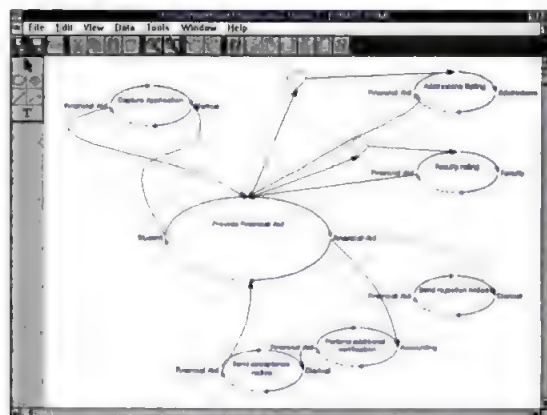
The product has two principal components: workflow-design software called ActionWorkflow Application Builder and a server-based engine called ActionWorkflow Administrator, which moves documents and information through the stages of a workflow. Application Builder costs \$1,495. ActionWorkflow Administrator is priced according to the number of users in the workflows to be generated, with prices ranging from \$200 a user (if you have hundreds of users) to \$800 a user.

ActionWorkflow is available in two versions, one that works with Lotus Notes databases and another that works with Microsoft or Sybase SQL Server databases; both use Application Builder. When the design process is complete, Application Builder creates the requisite Notes (or SQL Server) databases, against which Administrator then operates to keep the work flowing.

One of Action Workflow's strong points is the degree to which it automates this setup process, relieving the designer of much of the work associated with traditional database-setup procedures. Note, however, that the SQL Server version does *not* provide a user interface; you've got to build that yourself using a SQL-based front-end package. We tested the Notes version, in which workflow participants see the standard Lotus Notes interface.

MODELING WORKFLOW

You can reap the benefits of ActionWorkflow's analysis and design prowess only if you buy into the package's rather academic approach: Every workflow involves a *customer* (whose satisfaction is the objective of the workflow) and a *performer* (a person or group of people that will do the work). The model also dictates that every workflow have four phases: Preparation, Negotiation, Performance, and Acceptance. These concepts are reflected in ActionWorkflow's oval workflow diagram: The customer is named at the left, the performer at the right, and the four phases are represented by the four arrows that make up the oval.



To diagram a workflow in ActionWorkflow Manager, you must consider every element. This includes deciding exactly where a line leaves or meets an oval.

Workflow Automation Software

To get started with the workflow in our Form-Processing scenario, we created a single master oval representing the overall process, with the student as the customer and the financial aid department as the performer. We then divided the process into subsidiary processes, each with its own oval (and its own customer and performer). For example, in our Capture Application subprocesses the customer was the financial-aid department and the performer the clerical department. Arrows between the two ovals showed the dependence of the two tasks.

Action Workflow's methodology forces you to figure out for whom the job is really being done (that is, the identity of the customer) and, therefore, who needs to be satisfied before the process can move on. In many circumstances, this analytical discipline can be extremely beneficial; in others, it may prove an encumbrance.

Furthermore, this thoroughgoing analysis encourages you to think about and implement all possible conditions in the workflow. If a student withdraws his or her application, say, you can implement this alternative. You can also reassign work when someone's not there, or send notification when someone hasn't done something within a given amount of time.

TESTING IN ACTION

Much of our work with Application Builder involved trying to shoehorn the simple testing scenario into ActionWorkflow's model. This provided a good illustration of why ActionWorkflow may not be the product of choice for simple or informal workflow systems. Figuring out what the subprocesses were—what ovals we'd need—wasn't hard.

But figuring out both where to place the connecting lines (which show the sequence of subprocesses) and what was happening on them was. We had to figure out where in the Preparation, Negotiation, Performance, and Acceptance cycle the subprocess was invoked, and where it returned.

We created links to the Capture Application subprocess before Performance and after Acceptance; we skipped Preparation and Negotiation, which weren't very meaningful concepts in this data-cap-

ture application. This meant that the financial-aid department—the customer of the Capture Application subprocess—had to accept that the application had been captured before the loop was closed. But with this loop—as with all the others in the process—we decided that the Acceptance step would be declared complete automatically. Each subprocess loop, and each link, offers the designer many other equally murky choices.

READY, AIM, BUILD!

Once you've finished describing the workflow in Application Builder, you use a menu command to generate the actual Notes or SQL application. In the Notes environment, this adds a number of forms specific to this workflow process to a Notes database called AWS Transactions (see the Notes review in this roundup to learn about the significance of forms). These forms don't carry any application-specific data (like student name and address, for example). Rather, they present the workflow participant with informa-

tion on what's to be done, and what choices are currently available. The application-specific data fields—all those involved in the judgment of the financial-aid application, for example—are normally added by the application designer to the ActionWorkflow-generated forms, using the Notes forms-design interface.

Once the application is created, the AWS Transactions database becomes the central repository for all the forms, documents (which are really records in Notes), and even processes that are used in the application. Users interact with this database for information about the processes they are involved in; the benefit is that they have a single source for all their work.

Notes users in any workflow process generated by Application Builder will interact with the AWS Transactions database. But Notes applications developers may not like this arrangement, because it puts all the eggs into a single basket that's going to get more and more fragile as application-specific reports and queries are added to the AWS Transactions database. Furthermore, this arrangement makes it hard to revise workflows, because you have to delete all the forms and views that were generated by the last round every time you generate a new version.

Each user of the AWS Transactions database sees only those tasks awaiting his or her attention. Upon opening a document, or record, the user is presented with a set of possible actions, such as "I will do the evaluation now" or "I will do it later" (as defined by the designer back in Application Builder). If the user chooses to do the assignment now, another form is presented containing the information to be acted upon (as with the financial-aid application, for example).

ActionWorkflow Administrator, which runs on a single Notes server, automatically tracks who's doing what in the AWS Transactions database. When a user clicks the button that indicates a task's completion, Administrator notices, checks the workflow diagram, figures out what the next stage in the workflow is, and puts appropriate items in the work queues for those who must act next. Additionally, users can track the workflow via the AWS Transaction database.

► FACT FILE

ActionWorkflow Manager, Version 1.01

List price: ActionWorkflow Analyst, \$495; ActionWorkflow Application Builder, \$1,495 **Requires:** Administrator: 16MB RAM, 50MB hard disk space; Lotus Notes 2.0a, Server Edition for OS/2 2.0, OS/2 2.0 or later. Builder: 8MB RAM, 4MB hard disk space, DOS 5.0 or later, Microsoft Windows 3.1 or later, Lotus Notes 3.0 or later, Microsoft SQL Server for OS/2 or Sybase SQL Server for OS/2, Windows NT. Analyst: 4MB RAM, 20MB hard disk space, Microsoft Windows 3.1 or later. **In short:** The ActionWorkflow toolkit imposes a workflow design methodology that is either good discipline or stifling formality, depending on the inclinations and experience of the user. It includes a workflow-diagramming and analysis component and generates Notes databases that implement the workflows, so users only see Notes. An engine runs on the Notes server, monitoring the progress of workflows and moving documents from one stage to another.

Action Technologies Inc., 1301 Marina Village Pkwy., Alameda, CA 94501; 510-521-6190; fax, 510-769-0596

SUITABILITY TO TASK

	Power	Ease of Use
Installation and setup	GOOD	FAIR
Workflow creation	GOOD	FAIR
Tracking and reporting	GOOD	FAIR
Integration	GOOD	FAIR

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Workflow Automation Software

PREPARING FOR ACTION

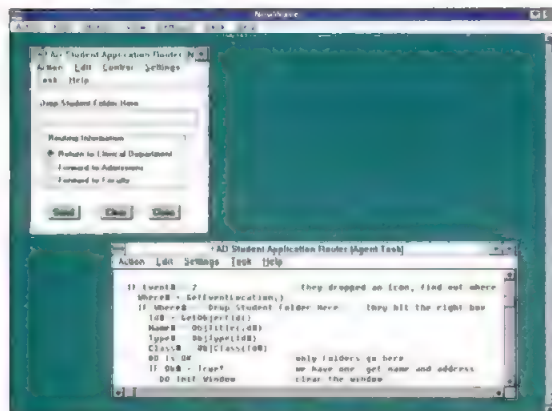
Some products, like Notes itself, are incrementally rewarding to their users: A little effort gets a little reward, and with every day of study and experience the payback grows. ActionWorkflow is more of a quantum reward product: A little effort gets you nowhere, but if you're willing to invest a significant amount of time and energy, you'll eventually experience a breakthrough, and the package will reward your effort. We fervently hope that the principal weakness of Action's Notes version—the fact that it keeps everything in one database—will be addressed and solved before too long.

JCST

● Archive Lite

BY M. DAVID STONE

Originally designed as a document management system, Archive Lite, Version 3.0, from JCST (Johnson Computer Software Team Limited), uses its document management capabilities as a starting point for handling workflow. Its two main functions—putting documents in a centralized database and notifying others of document status—are enhanced by inter-



In Archive Lite, you can write code in the NewWave Agent task language and watch as an on-screen form is produced.

operability with Hewlett-Packard Co.'s NewWave. NewWave is an object-oriented desktop organizer with workgroup file-sharing features.

Archive Lite's price for ten users is \$7,500 (which includes NewWave); the price per user drops as you add more users. There is also a Unix client/server version.

FIRST THINGS FIRST

Installation is easy. First, as administrator, you install NewWave, the Archive Lite administrator module, and a copy of the Archive Lite client module. Archive Lite will work on any network supporting NetBIOS, including LAN Manager, NetWare, and VINES.

Then you create an Archive Lite database on a shared network drive. (In Archive Lite, a database is a directory that holds Archive Lite's notification control program, indexing program, and database-related files such as the index to the data files. Note that Archive Lite makes a distinction between its database and its data files; each goes in its own directory). Next you install a DOS-level TSR that manages multiuser access to the database. You can create more than one Archive Lite database on the network, so that you can define and maintain different sets of users for each.

You can also define categories within each database. The categories help you organize data files and let you speed a search for a file by limiting the search to just those documents in a given category. (You can also search through all categories.)

Once you've created the Archive Lite database, and defined a minimum of one category, you need only define a list of users and passwords, assign users to groups, and install NewWave and the Archive Lite software for each user—either on each user's system or on a network drive. You must define users for Archive Lite; the program cannot read a NetWare Bindery or user list from an e-mail program.

CATCH THE WAVE

Archive Lite's workflow functionality is inextricably intertwined with NewWave features. For example, Archive Lite's

Approval Notification list (the mechanism for defining whom to send files to), or A/N list, appears as a new object type in NewWave. You tell NewWave to create an A/N list object. This opens a dialog box that lets you easily define what amounts to a mailing list.

You can add names to the list, insert them in any order, and specify if a person

▶ FACT FILE

Archive Lite, Version 3.0

List price: 10-user version, \$7,500; site licenses available for larger installations. **Requires:** Workstation: 4MB RAM, 10MB hard disk space, Microsoft Windows 3.0 or later. Server: Any NetBIOS-compatible network, 50K hard disk space. **In short:** Originally designed for document management, Archive Lite provides a central database and lets you modify documents in the database and notify others of changes in status. Included in the package is Hewlett-Packard Co.'s NewWave, which Archive Lite leans on heavily. NewWave handles creation of folders, procedural tasks, and on-screen forms.

JCST, 3080 Yonge St., #5072, Toronto, Ontario M4N 3N1; 416-487-3631; fax, 416-487-4850

SUITABILITY TO TASK

	Power	Ease of Use
Installation and setup	GOOD	GOOD
Workflow creation	FAIR	FAIR
Tracking and reporting	FAIR	FAIR
Integration	GOOD	FAIR

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needs to approve the attached documents or simply needs to be notified. You can also specify whether the A/N list should broadcast to everyone on the list at once, or send items sequentially and wait for approval where necessary before notifying the next name on the list.

With a sequential A/N list, you can define a workflow from beginning to end. But if you need to broadcast a document or documents, the A/N list will only define one step; you must define the next step or steps. You can define one or more A/N lists as part of a prepared workflow and store them with document templates for repeated use, or you can create new A/N lists to adjust the workflow as needed.

Via NewWave, you can put documents, A/N lists, and any other files into folders. You can then send all related files for a given job through each step in the workflow by attaching an A/N list to the folder. You can also add new files to the folder as appropriate, and even store A/N lists in the folder to use at later steps in the workflow.

For some workflow tasks—conditional routing, for example—you may need procedural control beyond what you can get with a sequential A/N list. You'll need NewWave's Agent feature for that. You can create Agent tasks via macros (to

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ATI Mach64		32
Diamond S3 964		32
WinBench 4.0		

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- **DPMS** automatic monitor power down

DynaView™ 2D CAD

MGA Ultima is bundled with DynaView 2D, Matrox's own powerful display list drivers for AutoCAD offering features such as, Dynamic **Bird's Eye** and **Spy Glass** views, Windows-like **Scroll Bars**, reconfigurable **Iconic Menus** and **Text Windows**. And MGA Ultima's AutoCAD performance under Windows is up to three times faster than the competition's. Dual display drivers are also available for MicroStation.

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Video View

MGA Ultima VAFC

MGA Video PRO

ATI
Mach 64

1280 x 1024

1280 x 1024

No

100 Hz

WinSwitch

No

Yes

Yes

No

Diamond
S3 964

1280 x 1024

1024 x 768

No

75 Hz

Only resolution switching available

No

No

No

No

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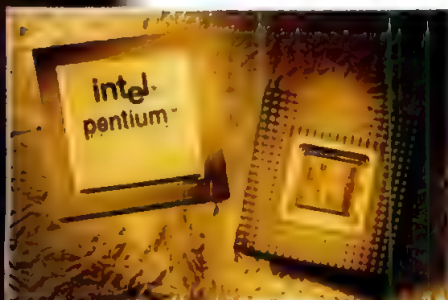


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CIRCLE 087 ON READER SERVICE CARD

Taking Off: JetForm

By James Karney

JetForm Corp.'s JetForm, one of the first electronic forms packages for the PC, has another upgrade on the way. In JetForm, Version 4.0, users will find improved form-design features and database and cross-platform support. Because the package was still in beta as testing was underway for this roundup, we could not formally review it. Here we've uncovered some of the highlights of the new package (which should be out by the time you read this), and compared the package to the other forms packages on the market.

JetForm's major advantage over its rivals is its cross-platform support. Though the Design module is Windows-based, you can use filters to run the Filler module (for filling in and routing forms) on Windows, DOS, and Macintosh systems, allowing a consistent enterprise solution for those environments. Further, JetForm has announced plans for future support of Unix, Windows NT, OS/2, and Lotus Notes.

Three components (each sold separately) help you get things up and running: JetForm Design, JetForm Filler, and JetForm Server. JetForm Design handles forms creation as well as initial security and management functions. The new interface provides access to action buttons, auto-increment serial numbers, a table creator and editor, and tear-off ribbons for setting field attributes.

The Design component allows scrollable fields that can contain data not always visible on the screen. Further, JetForm allows multipage forms and look-up fields from an existing database (an external database is required). Database links are handled via a menu; you must set up the fields and links in advance.

JetForm's workflow functions were not fully operational during our testing, but we did examine how they

were to be used. Routing can be handled by using e-mail addresses or by using department functions via a user-created third-party database. The workflow can be embedded in the form design and defined using menu selections; the end-user can add to the

JetForm 4.0 offers improved form-design features and database and cross-platform support.

Here we uncover some of the highlights of the new package.

list or create ad hoc modifications. Further, JetForm Corp. bundles Watermark, Explorer Edition, with JetForm.

Most forms packages offer a choice between easy forms design and the ability to route complex conditional workflows, but JetForm doesn't. Setting up conditional routing was simple in JetForm. We specified different views of the form for each user, which allows control of access to data on the form. In our sample financial-aid form, for instance, grade or income information could be limited to those with an approved need to use it. Still, JetForm lacks the scope of WordPerfect InForms' calculation functions in defining actions to be taken as a form moves among users.

Older versions of JetForm were criticized for supporting only a few third-party databases. Version 4.0 should change all that. The developers are planning to provide ODBC-compliant drivers with read/write and update capabilities for over 20 data-

bases as part of JetForm Designer. These drivers include Bettrieve, DB2, dBASE, Informix, Ingres, OS/2 DBM, Progress, Oracle, NetWare SQL, Paradox, and Microsoft SQL Server. The Forms Tracking Director Server Module lets administrators set up a database for tracking a given form's precise location based on a number of keys; those keys include sender, recipient, and list of keywords.

JetForm Filler grants end users access to forms, allows data entry, and provides the ability to attach other documents to a message. Users can set annotations (called JetNotes) on forms, send a series of forms as a single message, and use OLE to embed other files within a transmission.

The JetForm Server has been broken up into several modules. The Base Product, the entry-level server, offers merge and print services as well as the ability to collect, read, and process e-mail messages. The new Forms Distribution Director allows automatic updates of new or modified forms through a network, and the Forms Fax Director permits use of a server-based forms fax service.

JetForm's improved database support, cross-platform support, and Designer interface make it a likely choice for complex enterprises. Nonetheless, skill and proper planning are necessary if you want to get the full benefit of the package. A novice user might not have the solid understanding of data relationships that is necessary in setting up forms or workflow routing in JetForm. □

► **JetForm, Version 4.0.** List price: Design 4.0, \$495; filler (five-user version), \$595; Basic Server, \$795; distribution, tracking, and fax modules, \$495 each. JetForm Corp., 305 Watermill Center, 800 South St., Waltham, MA 02154; 800-538-3676, 617-647-7700; fax, 617-647-4121.

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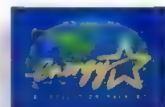
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Workflow Automation Software

record simple tasks) or the Agent task language (to write complex programs). To create dialog boxes, you don't write code; rather, you insert controls by eye. This way, you can create a dialog box with a set of choices for the next step in the workflow. Furthermore, Agent tasks can control virtually any Windows or DOS program—much like the Windows Recorder. This is useful, as Archive Lite has no modules for creating forms, writing letters, or controlling scanners.

To end users, Archive Lite looks and acts much like an e-mail system, but there's no actual message or at-

tachment delivered to your system; the folder and A/N list stay in the central database. When you open a folder or file that's stored in the Archive Lite database, the program moves a copy to your local hard disk. When you're done working, it asks whether you want to move it back to the central database. If other users try to open the copy in the central database while you're working with the file, they can only make a copy of the file; they can't access it.

PUT TO THE TEST

Archive Lite lends itself well to workflows that may change on ad hoc bases. In our testing scenario for creating a collaborative document, there was little preparation needed for establishing the workflow. We set up the A/N lists that would be needed at each stage and created what amounted to a set of templates for memos and other documents using our desktop apps. We then created NewWave folders—and put some within other folders—and put everything in a Bidding folder. In creating the Bidding folder, we assigned access rights to the folder for each group of users.

To start a new project, the administrator creates a new category in the database. After that, the CEO can drag the Bidding folder to the Archive icon or window to create a new master in the database, use his or her word processor

to modify the memo that notifies everyone of the new project, and send the folder by way of the Notify Everybody A/N list that's also stored in the Bidding folder. Each department removes the templates for the documents that it's called upon to produce and modifies them or creates new documents using the appropriate software. Then the departments return the templates to the central database using the prepared A/N lists.

In this scenario, each user must know which A/N list to use at each stage in the workflow. You could include instructions in the folder—using anything from a sim-

ple text file to a NewWave Agent task. Still, each user is basically free at each step to create an entirely new A/N list and change the next step.

Archive Lite is less well suited to more structured workflows, such as the one in our Form-Processing scenario, but it can still help the job along. Using NewWave, you can choose the proper A/N list for routing, create new documents and folders, and scan documents.

To track workflows, you query the database to see the current status of the folder. The query feature is reasonably sophisticated and easy to use. You can easily search for a folder or file by type, category, author, dates saved, keywords, or a combination of these. When you find the folder or file, you simply open the attached A/N list and look at the status of the approval and notification lines to see how far the file or folder has made it through the workflow.

Clearly, Archive Lite is not meant for building highly structured workflows. In many offices, however—from law firms to magazine editorial departments—users understand what they're doing and often need to modify the flow on as-needed bases. In those cases, what one really needs is not a straitjacket to force a particular workflow, but an aid to speed workflow. Archive Lite offers precisely this aid, and at a reasonable price.

Archive Lite lends itself particularly well to workflows that may change on ad hoc bases, requiring very little preparation for establishing these workflows.

Banyan Systems Inc.

● BeyondMail Forms Designer

BY JAMES KARNEY

BeyondMail Forms Designer, Release 2.0, is not for the timid, but once conquered it can be an exceptional tool for creating workflows. The package, from Banyan Systems, offers a complex set of rules that can be used to manage workflow routing of e-mail and electronic forms. This \$495 product is an add-on to Banyan's e-mail service, BeyondMail, rather than a standalone solution.

RULES ARE RULES

The real magic with BeyondMail Forms is in the tight fit with the BeyondMail e-mail program and Novell's MHS (Message Handling System). BeyondMail Corp. (recently purchased by Banyan) originated rules-based messaging, and its products still have the edge in this area. This rules-based technology gives a designer almost total control over a form and its behavior, allowing the use of variables,

▶ FACT FILE

BeyondMail Forms Designer, Release 2.0

List price: \$495; BeyondMail 2.0 for MHS, Professional Edition (10 users), \$995 **Requires:** 4MB RAM, 12MB hard disk space, Microsoft Windows 3.0 or later.

BeyondMail in short: BeyondMail Forms Designer leverages its BeyondMail e-mail base to provide a tool for sophisticated enterprise-wide workgroups. To get the full benefit requires a skilled developer, not to mention the company-wide use of BeyondMail products coupled with Novell's MHS. But in return, you get a robust environment for electronic communications. If you're seeking a complete solution that is compatible with MHS, you might want to check out BeyondMail Forms. Keep in mind, though, that the product lacks some features that you might expect to find in such an advanced package.

Banyan Systems Inc., 120 Flanders Rd., Westboro, MA 01581, 800-222-6926; fax, 508-898-1755

SUITABILITY TO TASK

	Power	Ease of Use
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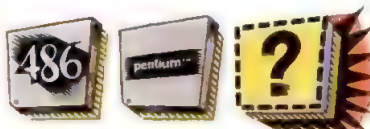
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Workflow Automation Software

calls to system services like time and date stamps, and use of DLLs. The rules can be used to automate and control data entry and check that fields are properly filled out. Also, a MailMinder module lets you automate routing through standard distribution lists.

In our Form-Processing scenario, we were able to use rules and options on forms to control what parts of the applica-

Nevertheless, the product lacks some features that one might expect to find in such an advanced package. For instance, there are no direct database links (although Banyan does include Q+E drivers in BeyondMail Professional) or support for electronic signatures. You can use an add-on, such as Software Database Library's Q+E, but built-in access would be much better.

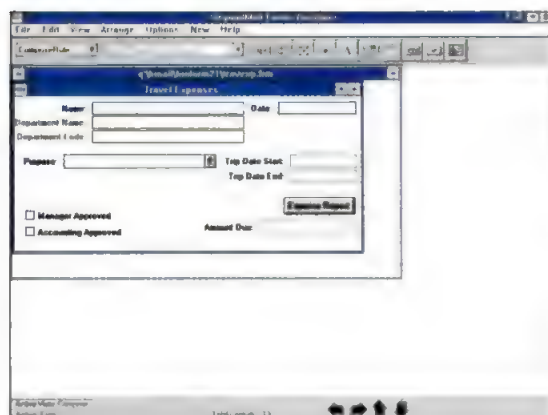
Also, to gain access to the extant features, your organization must commit to using MHS or BeyondMail (BeyondMail 2.0 is \$995), and perhaps the \$995 Add-In Toolkit for database support as well.

NOT TRUE TO FORM

Instead of mimicking traditional paper-based forms, BeyondMail Forms fully replaces paper-based work processes. There are no provisions that allow easy development of multiple forms or of forms too large to be displayed in their entirety on-screen. Getting full access to information is limited

created for Windows, DOS, and printer use, and the package lacks full support of scalable fonts. If the package could provide for direct hard copies of an on-screen form—users can have only an imitation, hard-coded by the developer—there would be faster form development and better access to the information for off-line use.

BeyondMail Forms offers a solid set of tools for creating workflows, but you must be willing to spend a good bit of time learning how to apply BeyondMail's rules. If you are interested in a complete solution that is compatible with MHS—and have the resources in network and forms management and development to operate it at its full potential—it may represent the best approach for you. If your needs are simpler, or your budget is smaller, it might be best to keep shopping.



Gaining access to the full potential of BeyondMail Forms Designer requires knowing how to apply BeyondMail's rule structures to workflow applications.

tion were seen by different users. We were able to compartmentalize and route information to recipients as needed; BeyondMail Forms users aren't forced to transport an entire document to all persons on a distribution list. We were also able to code reports and management tools to appear automatically in the right users' mailboxes. Still, the rules language is not as simple to access or learn as the macro router in Delrina FormFlow.

You can embed C and C++ routines in a BeyondMail Forms application for even more sophisticated applications, including calls to other programs. A developer can set up complex conditional workflows, making it easy for end users to branch tasks and allowing the same form to perform differently for individual workgroups within a company. For example, in our Form-Processing scenario, we had the package route a form past a person who was out on vacation, limit the display of information based on a user's need to know, and regularly remind a recipient of past-due material that had not been handled. BeyondMail Forms was the most able of the reviewed form packages for controlling conditional routing.

for those not on the network.

If your company has to duplicate printed forms on-screen, BeyondMail Forms' focus on the screen and electronic copies may pose a problem. Firms that must file copies to meet regulatory requirements, or interface with other companies' existing forms, may face difficulty adopting BeyondMail Forms. The design limitations make it almost impossible to match a standard letter-size page to an electronic form.

BeyondMail Forms, which runs under Windows, is used to create forms that can be used by both Windows and DOS users. The DOS screens can be made to look and work very much like their Windows counterparts, allowing a common user interface.

The package's design tools are a bit cumbersome for those used to either Windows-based drawing programs or a design-oriented package like Delrina FormFlow. The designer uses different interfaces for each task. There are separate views for composing the master form, creating the hard-copy version, and controlling what the end user can do with the form. The Rule Editor view is used to access the BeyondRules language.

Different versions of each form must be

Delrina Corp.

EDITORS' CHOICE
Delrina FormFlow

BY JAMES KARNEY

Delrina Corp. targets Delrina FormFlow, Version 1.0, at small companies and corporate workgroups—with very good aim. Those who design workflows will need a copy of the \$399 Windows-based Manager Module, which includes FormFlow Designer and one copy of FormFlow Filler. Users who enter data into forms need licenses for FormFlow Filler; the User Module costs \$129 and includes one Filler.

FormFlow can be tied to most e-mail systems for forms transport (support for Lotus Notes is also planned) and to most databases for data storage. The package has read and write support for Clipper, dBASE, DB2/2, Microsoft SQL Server, Oracle, OS/2 Database Manager, and Paradox engines. Rather than using ODBC (Open Database Connectivity), Delrina provides native support to improve speed.

If you don't have an existing database, FormFlow can use its built-in data repository to manage fields, track records, and manipulate simple calculations. We found it was able to handle all the requirements for our test applications directly.

FormFlow is easy—right from the start. It took 8 minutes to install the product on our test-bed and set up user accounts on our seven workstations (which were running Microsoft Windows for

Lotus Notes and Its Add-Ons

By John Helliwell

As Lotus Notes has penetrated the corporate marketplace, it has spawned many add-on products aimed at companies that have already invested in Notes. None of these products are impressive enough to lead anyone to buy Notes for its own sake, but if you're already a Notes shop, the right package might improve the quality of your Notes life. Some packages here help Notes workflow developers by extending the capabilities of Notes.

- **Lotus Notes: Document Imaging, Release 2.0 (LNDI)**, from Lotus Development Corp. (800-343-5414), makes Notes a much more powerful tool for handling large databases of images; this is important for automated workflows that used to depend on paper. The cost is \$99 per client, \$3,000 per server.

- **Remark! PhoneClient 2.0 for Lotus Notes**, from Simpact Associates (619-565-1865), provides a telephone interface to Notes. A workflow application can be driven by the touch-tone instructions of dial-in users and can record or play back voice information contained in Notes databases. The base system sells for \$2,850 and runs on a Notes server that's equipped with a \$1,795 add-in phone interface board.

- **Watermark Discovery Edition, Version 1.04**, from Watermark Software (617-229-2600), uses OLE technology to ease captures of scanned and faxed images in Notes. It works with all Twain and ISIS scanners and with many client programs other than Notes. If you use Watermark to embed scanned images in a Notes database, you must buy a copy of it for each Notes user who will need to examine the image. The cost is \$149 per user, with volume discounts.

- **WorkMAN for Lotus Notes, Version 1.0**, from Reach Software (800-624-5356), extends Notes specifically in the workflow direction. WorkMAN for Lotus Notes, in beta while we were

preparing for this issue, includes some of the features of the standalone WorkMAN product, reviewed separately. A workflow automated with WorkMAN for Lotus Notes presents users with a familiar Notes interface. It doesn't require any extra Notes server processes, but it does require each user to run a WorkMAN process (even if he or she runs it from the network) locally. The cost is \$1,995 for a Developer Starter kit that includes a two-user license.

Finally, we looked at three currently shipping Notes add-in products—aimed directly at the workflow automation market—that enhance Notes' workflow capabilities in three quite different ways.

FLOWMAKER, VERSION 1.0

FlowMaker, Version 1.0, a tool for generating Notes code, is appealing because of its modesty. The package, from WORKflow (708-647-0444), doesn't draw you into its own world as some Notes-based workflow products, such as Action Technologies' Action-Workflow Manager, do. Instead of adopting elaborate workflow description tools, FlowMaker simply produces Notes macro instructions that you paste into your own Notes applications.

Its workflow-design interface is a pencil and paper; it's up to you to sketch out how you want the work to flow. The main constraint is that you have to describe the flow in terms of *states* (an application's state, for example, might be "awaiting faculty comment"), *roles* ("faculty," for example), and *moves* (such as "forward to financial-aid department").

You describe these in outline format, specifying what conditions need

to be satisfied before the work can move on to the next state. You also construct a standard Notes database containing the application-specific forms you need (for example, a financial-aid application form).

The form must contain Notes access-control sections corresponding to the roles in the workflow. Each

In FlowMaker, you describe the states, roles, and moves in your workflow. When you're done, the package generates Notes buttons and macro code that implement the workflow when they are pasted into a form in a Notes database.

section must contain the fields that are specific to that role (the Faculty section would contain a field for a professor's rating of the student) and a button that users would push to move the work forward.

Next, you tell FlowMaker to generate the macro code for the application, step by step. For each stage in the flow, FlowMaker will produce the code necessary for the button in that section, and for the section-definition field. The code is posted to the Windows clipboard; you then go to Notes, invoke the design interface, pop open the button or field formula dialog, and paste the code into place. You follow similar steps to generate code for Notes background macros that move the workflow forward.

FlowMaker would appeal to an

CONTINUES

Notes and Its Add-Ons

CONTINUED

experienced Notes developer who wants some help with the tedious elements of Notes programming. Because events are all visible, processes can be deciphered fairly easily as the application is being debugged. FlowMaker is \$9,995 per copy (it comes with a parallel-port security device); the product is licensed on a per-developer basis. Also, the company offers a \$99 30-day trial period.

QUALITY AT WORK, VERSION 3.0

Quality at Work (QAW), Version 3.0, from Quality Decision Management (508-688-8266), extends the usefulness of Notes mail in workflow applications in two ways: by letting users kick off ad hoc mail-based workflows, and by letting occasional workflow participants do their duties (approving a form, for example) in their personal mail databases instead of forcing them to use an unfamiliar, shared workflow database.

QAW has three main components: a QAW Business Utilities template that's used to redesign users' Notes mail databases, a process that runs on a Notes server and interacts with those redesigned mail databases, and a Notes server database called Command Center. The template adds five new forms to the standard Notes set. Each form—Action Item, Brainstorm,

Opinion Poll, Request Approval, and Dialog—launches a different kind of ad hoc consultation among a user-selected group of fellow Notes users.

A user wishing to launch an Opinion Poll picks that form from Notes' Compose menu. The Opinion Poll form has fields for the names of poll participants, the questions, and the answer choices. Complete forms are sent off as though they are normal Notes mail messages.

The QDM engine, running on the server, intercepts the form and figures out who it has to go to, whereupon Notes mails it. Each recipient opens the document and records his or her opinion in the reply. The engine tracks the process and posts the results by editing the original document in the sender's mail database. At any time, the sender can check who has answered, who hasn't, and what the poll results are. Other types of ad hoc workflows work in comparable ways. As an extension of these workflows, QAW makes it easier to use Notes mail in formal workflows with its Business Builder kit.

Typically, Notes workflows require that all workflow users interact with shared workflow databases residing in a Notes server on a LAN; mail is used only as a notification mechanism.

Remote users, and any users involved in a workflow only occasionally, find this inconvenient. They would rather receive a mail message asking for their input, provide that input directly on the document received, mail it back, and move on without having to deal with any other Notes application.

QAW allows for this kind of process, using the forms that it has installed in users' Notes mail databases. In our financial-aid workflow, we altered the QAW Action Item form so that it fired off

a request (and modified the Notes workflow) for faculty comments about a student only when it was required. The faculty member would see the request, provide the required comment, and send it back to the workflow database.

Ad hoc workflows, such as the Opinion Poll shown here, can be initiated by any Notes user with a QAW-redesigned mail file. This document shows the results of a poll as it appears in the initiator's mail file.

QAW can't automatically update the financial-aid form with the professor's input. Rather, someone must view the database, watch for new input, and mark the associated financial-aid applications as ready for further processing. (But Workflow Innovation Toolkit, below, could help automate that process.)

The QDM Business Utilities (basically, the redesigned mail files and the server engine) cost \$99 per user. For this price, you're limited to mail-based ad hoc workflows. To use QDM in the design of formal Notes workflow applications, you'll also need the QDM Business Builder, at \$999 per server.

WIT, THE API LIBRARY, VERSION 2.0
Workflow Innovation Toolkit (WIT), The API Library, operates at the back rather than the front of the workflow automation process. The package, from Application Partners (908-603-7742), doesn't help you analyze, design, or program a workflow, but it does help with behind-the-scenes data manipulation. WIT is a single program constructed using Lotus's Notes API; it runs on any Notes server and facilitates

WIT uses documents in its Notes database to control the actions of its engine running on a Notes server. The user can define when the workflow will be performed and specify actions in response to workflow status.

Workflow Automation Software

automating routines such as moving documents from one database to another or reporting on progress.

WIT's server process is driven by its own Notes database, in which you specify the actions you want WIT to take. A typical WIT task might be to move financial-aid application forms from the main workflow database to one used exclusively by the accounting department. In the WIT control database, you'd name the database you want to monitor for application forms that are ready to move (the "trigger" database), describe how WIT should recognize those documents (for example, the NextAction field is equal to "Accounting Input"), and tell WIT what database the accounting department uses (the "target" database).

WIT and its control database aren't tied to any Notes application; you can use them for housekeeping in different workflows (and in nonworkflow applications) at the same time. Besides moving documents from trigger to target, WIT can alter the trigger documents and alter other documents in the target based on information in the trigger (for example, add a notation to the student's record in the admissions department database indicating that a financial-aid application had been received). It can also use the trigger to control moves from yet another database (called the "source") to the target, post reports on database activity into the target, generate sequential numbers and use them in a target database, and do a number of other comparable chores.

The control database lets you set up some complicated sequences of action, so its interface is complex. But it's also fairly self-explanatory, so you can use it for straightforward tasks (such as the ones mentioned above) rather easily, and you can gain some experience before setting it up to do fancy stuff. The WIT developer's kit costs \$3,995 (including one running server); additional runtime servers are \$1,000 each.□

Workgroups 3.11 over Novell's NetWare 3.12). We linked the program to an existing Microsoft Mail post office, and it automatically created a user list from the server's NetWare Bindery. FormFlow also supports other MAPI (Messaging Application Program Interface) services as well as VIM- and MHS-compliant e-mail systems. The package can be used with all major network environments—Microsoft LAN Manager, NetWare, OS/2 LAN Server, and VINES—but form creation and use must be carried out under Windows or Windows for Workgroups.

DESIGNER TOOLS

Our testing showed FormFlow to be an able performer. The design process was straightforward, and the interface was easy to use and understand. FormFlow provides an extensive array of tools for form design. Many elements—such as data entry fields, tables, and selection boxes—are available from an object library and can be dragged and dropped onto a form. The package also provides 100 modifiable sample forms. If you specify fields from an existing database, FormFlow will produce a basic page that appears with those boxes, linked and ready to go. With these features, the package allows you to produce exact copies of existing paper forms with ease.

In our Form-Processing scenario, we gave users the option of selecting admissions- and faculty-priority levels for each student. For this, we used a list box with up- and down-arrow control and a restricted list of priority levels. Once a form was completed, lookup tables let us reduce data entry by offering the ability to draw on information already contained in the database.

STRONG LANGUAGE, WEAK VOCABULARY

For workflow, FormFlow provides a simple yet effective method. You run the built-in macro recorder—which lets you record a script as you work for later replay—and walk through the routing steps. For linear routing, you simply run the macro recorder and define the addresses you want (recipients are selected via their mail addresses). Macros can be assigned to buttons and objects on a form, as well as to the form itself. In the latter case, you can automate functions that are activated

when you enter and exit a form.

When you use the macro recorder, the program will automatically write the code, using the IFL (Intelligent Forms Language), the BASIC-like language Delrina uses. The recorder can't manage conditional workflows; these must be programmed manually. The effort is about the same as for a simple BASIC routine; it is not for an average end user. Still, most applications would not require a high level of programming expertise.

For more complicated applications, especially those demanding conditional statements, you would use the IFL, which offers much more flexibility than its macro set. The IFL provides a wide range of built-in routing and query options, but it needs a better command set. There is no CASE statement, for example, so the code for branching a route winds up a lot more complicated than it needs to be.

In our Form-Processing scenario, we were able to build in some routing conditions using the IFL. If, for example, the admissions department were to assign a low priority number to a student, the form would be routed directly to the mailing department, skipping all other departments, where a rejection letter would be generated and sent off.

You can freeze, hide, and protect portions of a document. There is support for

▶ FACT FILE

Delrina FormFlow, Version 1.0

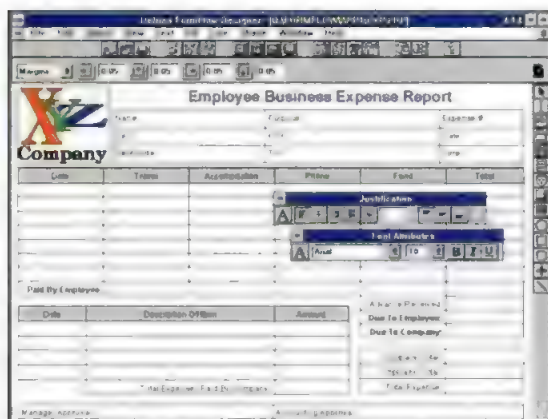
List price: Manager Module (includes FormFlow Designer and one copy of FormFlow Filter), \$399. User Module (includes one filter), \$129. **Requires:** 4MB RAM, 4MB hard disk space, Microsoft Windows 3.1. **In short:** Delrina FormFlow is an excellent solution for organizations that have Windows workstations and want ease of use and rapid forms design. It can handle its own database requirements and operate on a variety of LANs. Its only limitations are its lack of cross-platform workstation support and its slightly cumbersome language for creating conditional workflows.

Delrina Corp., 6830 Via Del Oro #240, San Jose, CA 95119. 800-268-6082, fax, 408-363-2340.

SUITABILITY TO TASK

	Power	Ease of Use
Installation and setup	GOOD	EXCELLENT
Workflow creation	GOOD	GOOD
Tracking and reporting	GOOD	GOOD
Integration	GOOD	GOOD

461 on reader service card



Delrina FormFlow's macro recorder can be used to set up basic workflows, but defining elaborate conditional routing requires programming skills.

electronic signatures, and any user's privileges for reading and manipulating a form can be limited. In our Form-Processing scenario, we were able to lock data fields and signature blocks.

FormFlow is a product well suited to the needs of any Windows-based workgroup or small business that wants an easy-to-use forms product. If you don't need conditional routing, getting it up and running should require no programming and very little time. If you can bring programming expertise to bear, FormFlow can handle very complex tasks, albeit a bit inelegantly. Delrina has done a very good job of producing a well-rounded, tightly designed workgroup forms package that takes full advantage of the Windows environment.

IBM Corp.

● IBM ImagePlus/2

BY JOE SALEMI

IBM ImagePlus/2, Version 1.0.6, is an OS/2-based client/server image management and workflow system that's primarily designed to import, manage, and route images. You import paper forms into the program as bitmaps from a scanner or fax, and route the images for processing using ImagePlus/2's workbasket metaphor; a workbasket represents a task or action point in the flow. Because creating a rules-based workflow requires considerable programming, and because ImagePlus/2 is a powerful and pricey system, the package is likely to be used for developing vertical-market systems.

There is no built-in form creation, but you can create an index screen—which provides some form-like capabilities—for each image. The index screens contain data fields that the user fills in, usually pertaining to the document being worked on. IBM's DB2/2 database is the indexing engine for the data entered in the index forms. ImagePlus/2's use of DB2/2 makes it a true client/server application, but you must be able to set up and maintain the database server besides manage the ImagePlus/2 system.

Client/server architecture makes the system very efficient in terms of disk storage. As is the case with most of the other workflow packages, the images, notes, and indexes are stored on the server, and the folders only contain pointers to them. The workstations need disk space for just the software and some temporary files created by ImagePlus/2.

ImagePlus/2 requires OS/2 2.x on both the server and the workstations. It runs only on IBM LAN Server 2.0 or better, though it will coexist with a NetWare LAN running on the same cable and workstations. The basic ImagePlus/2 package costs \$2,495 for the server software and one client; additional client packages cost \$395 each. You'll also need DB2/2, which costs \$2,495 for the server and one client and \$75 for each additional client. A ten-user system would thus cost \$9,220. You'll also have to factor in the cost of the LAN Server software if you're currently using another network. ImagePlus/2 is limited to 50 concurrent users per server and only one server per LAN. If you have more than 50 users, you can use a routable version of ImagePlus/2 running on a NetBIOS TCP/IP or APBC network, or—if you want to provide access to the workflows from multiple LANs—you can move either to AS/400- or IBM-mainframe-based versions of ImagePlus/2 or to IBM's new IBM VisualInfo for OS/2.

IBM recommends that the server must be at least a 33-MHz 486 system with 16MB of RAM (IBM recommends at least 24MB) and 320MB of disk space. For workstations, IBM recommends a 33-

MHz 386DX with 12MB of RAM and 100MB of disk space.

SETTING UP

Before ImagePlus/2 can be installed, the DB2/2 database must be up and running on the LAN and the DB2/2 client software must be installed on each workstation. The ImagePlus/2 software is distributed on a CD-ROM; you can install it from a CD-ROM drive attached to the server so that all the user workstations can access it. The installation process is simple but slow: It can take more than an hour if you're installing DB2/2 and ImagePlus/2 at the same time. The workstation software is then installed across the LAN from the CD-ROM on the server.

ImagePlus/2's administration program lets you set up the user IDs, manage the storage system, set up the workbaskets, and set up document types and key index fields. The administration program is also used to manage the security system, which is very tight. User access can be restricted to certain workbaskets, as well as to certain index fields. One minor problem we found is that the administration utility requires exclusive access to the ImagePlus/2 system; all users must log off the system before any administration can be done.

► FACT FILE

IBM ImagePlus/2, Version 1.0.6

List price: Server software (for both LAN and standalone environments), \$2,495; each additional workstation, \$395

Requires: Server: 16MB RAM, 320MB hard disk space, Token-Ring or Ethernet cable, DB2/2, OS/2 LAN Server 2.0 or 3.0, OS/2 2.0 or later. Workstation: 12MB RAM, 100MB hard disk space, Token-Ring or Ethernet adapter, DB2/2, OS/2 LAN Requester, OS/2 2.0 or later.

In short: IBM ImagePlus/2 is a sophisticated OS/2-based image management system for organizations that rely on paper forms and reports. It can manage other types of images, such as bitmaps of photographs. Also, it is more of a development platform than an end user package.

IBM Corp., 10401 Fernwood Rd., #Md22B1, Bethesda, MD 20810; 301-803-3169, fax, 301-803-3891

SUITABILITY TO TASK

	Power	Ease of Use
Installation and setup	FAIR	FAIR
Workflow creation	GOOD	FAIR
Tracking and reporting	FAIR	FAIR
Integration	POOR	POOR

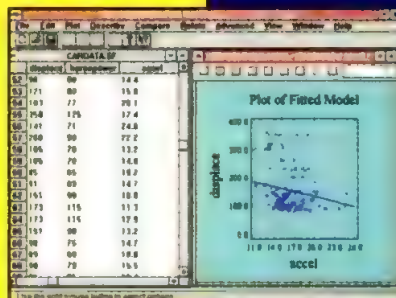
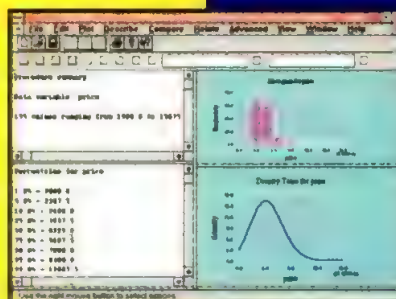
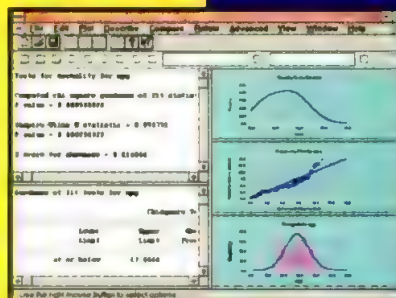
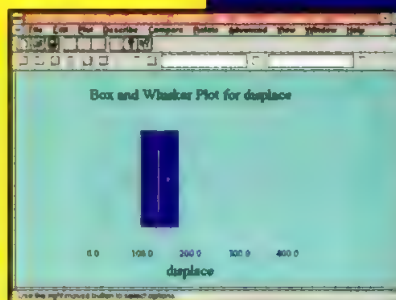
462 *Visualizer* (server) and

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CIRCLE 365 ON READER SERVICE CARD

Workflow Automation Software

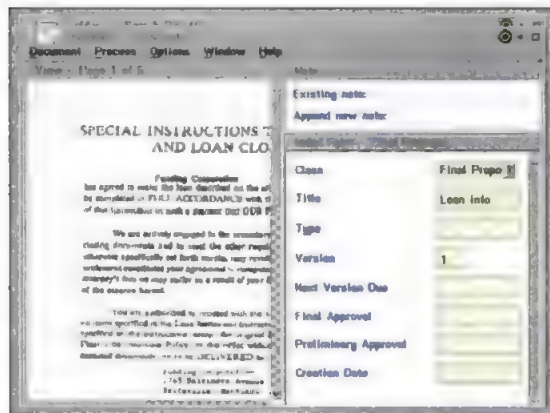
THREE FACES OF IMAGEPLUS/2

ImagePlus/2 comes with three main components: the Service, Application, and Store and Retrieve facilities. You use the Service facility to import documents, create index forms and workbaskets for each task, and set up predefined workflows. You do not have to set up predefined workflows; you can simply place an item in a workbasket and send it along on an ad

Retrieve facility, on the other hand, shows a desktop window containing all the workbaskets to which the user has access. Both facilities support drag-and-drop; once a task is complete, users can click on the folder icon and drag it to the next workbasket in the flow.

We ran the package through our Form-Processing scenario, in which a financial-aid application is automatically

mainly for firms needing ways to manage paper documents that can't be easily converted into electronic forms. It's more of a development platform for image management and workflow applications than an end user package, so you are just as likely to use it as part of a value-added reseller's custom workflow application as you are for in-house application development.



IBM ImagePlus/2 manages scanned or faxed bitmapped images of documents. Extra information on the image is entered and stored in notes fields and index forms.

hoc basis. But if you must define workflow processes based on user input, you have to do so via user-exit procedures (which run when the user exits a form or task). These procedures are programmed as external DLLs or REXX scripts.

ImagePlus/2 provides built-in support for scanning or faxing images, and it links to a number of Windows-based scanning and fax programs through OS/2's DDE capabilities. ImagePlus/2, Version 2.0, scheduled for release in September 1994, will have even broader scan and fax support; it will also have e-mail support.

ImagePlus/2 revolves around file-cabinet and workbasket metaphors. File cabinets are divided into workbaskets, and workbaskets into folders. The folders, which hold all the documents related to a task, are dropped into workbaskets for processing. Users access the workbaskets through the full-featured Application facility or the simplified Store and Retrieve facility.

The Application facility uses a graphical display of all the ImagePlus/2 system resources the user can access, starting with the file-cabinet icon. The Store and

Retrieve facility, on the other hand, shows a desktop window containing all the workbaskets to which the user has access. Both facilities support drag-and-drop; once a task is complete, users can click on the folder icon and drag it to the next workbasket in the flow.

We ran the package through our Form-Processing scenario, in which a financial-aid application is automatically moved from task point to task point, depending on the values entered for certain fields in the application form. ImagePlus/2 was able to perform most of the tasks. But the only way to perform many steps, such as providing ratings for the students, was to create index and note fields that the user had to fill in based on the data in the document image. Furthermore, it was not easy to define workflow based on answers provided at each step in the workflow; we had to base the definition on values in the index fields, which required extensive programming of user-exit procedures.

Our second testing scenario centered around a collaborative document and ad hoc routing. Supporting ad hoc applications is ImagePlus/2's strength: Users are free to send a document to anyone, rather than being bound by input results such as "Approved" or "Rejected." We didn't encounter any problems in this scenario. We used notes and index fields to assign task priorities and keep track of document versions. You can have the Application facility notify you if a task isn't done by a certain time or date.

You can use ImagePlus/2 to store, display, and route any type of image that can be converted into an OS/2 bitmap. It ships with sample bitmaps of classic works of art and photographs. It also lets you use voice annotation in the notes field if you have a sound board that OS/2 supports. The voice annotations are saved in .WAV files that become part of the document folder.

ImagePlus/2 is a powerful, sophisticated system designed

Keyfile Corp.

EDITORS' CHOICE
Keyfile Enterprise Edition

BY STEVEN C. M. CHEN AND TED STEVENSON

The primary focus of Keyfile Corp.'s Keyfile Enterprise Edition, Version 2.2, is managing documents, but the product brings its considerable prowess to bear on many aspects of creating and managing document-centered workflows as well. In addition to automating and systemizing the routing of work documents based on user input, Keyfile gives workers many ways to view, edit, annotate, and otherwise change such documents, and to add documents to a work folder as it moves along a flow. This workflow package also provides a rich set of tools to simplify mundane daily tasks such as faxing and scanning.

Keyfile's versatility does not come cheap: Altogether, a ten-user Enterprise package will cost you \$12,995; this includes the Keyfile Document Server for OS/2 (\$4,995) and Keyfile Desktop (\$795 per user). (A Windows-based Workgroup Document Server is available for \$2,995, but it supports a maximum of only 5 users;



To add more tools to your Keyfile desktop, drag the tool icon from the ToolBox to the desktop. The in-basket can receive files or folders.

LOOSELY DEFINED, IT'S THE T OF HAVING A G



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save time. You're more productive. But you've no doubt heard this before. Let's get to the specifics.

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the words “as soon as possible.”

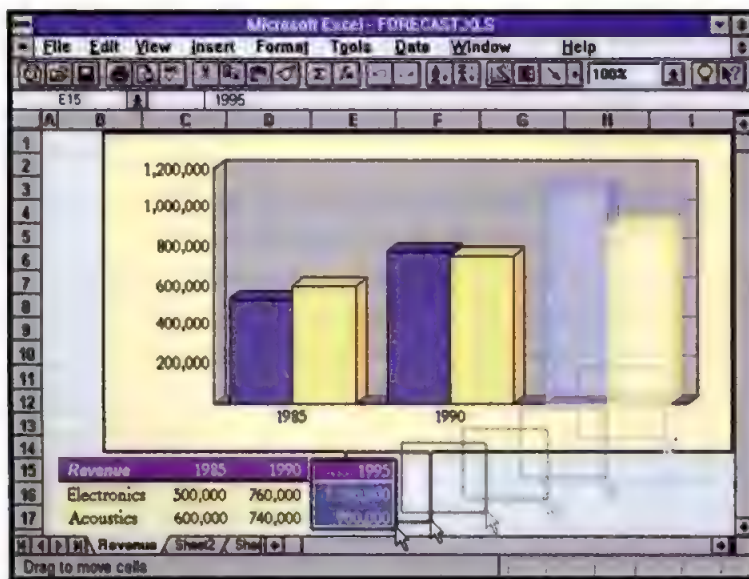
Then hit AutoFormat to create a great-looking document fast. All you have to do is get your ideas down and click, it's a memo. Click, it's a report. Click, it's a letter.

Want to personalize those letters for each customer? Using the Mail Merge Wizard in the new Microsoft Access® database makes it a snap to link customer lists to

your word processor.

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Naturally, you may need to analyze those figures in a Microsoft Excel



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example, “teh” is automatically replaced with “the.” Or you can use it as a high-tech shortcut. Just type “asap” and it's replaced with

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Certainly, work like this merits a little showing off.

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get started by organizing the structure and content of your most common presentation topics (selling

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But perhaps the smartest aspect of these best-selling programs is this: They are the only products of their kind that have unlimited product support with no service charge.*

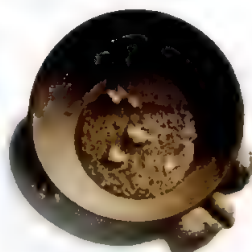
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volume discounts for the desktop package begin at 50 users.) Options include an MHS Communication Server, a Calera Advanced OCR Server, and support for copious optical storage. Note that the Enterprise Edition is not available from your local software store. Look instead for a Keyfile-certified value-added reseller or integrator.

Installing Keyfile is straightforward, but you first need to get NetBIOS up and running. This allows Keyfile to work with most popular networks. For a basic setup, all you need is an OS/2-capable PC for the Keyfile Document Server and Keyfile Desktop installed on each PC. Keyfile users can currently access only a single, preassigned document server. With future releases, however, access to multiple servers will be transparent to users. Keyfile is unable to read the NetWare Bindery for the purpose of creating groups and users without an additional (free) utility, obtainable directly from the company or through Keyfile-certified value-added resellers.

For testing purposes, we installed the advanced OCR option and Calera OCR software, each on its own server. We also installed an HP ScanJet IIcx and an Intel SatisFAXtion board. In a real-life situation where you do a lot of faxing, scan-

ning, or optical character recognition, you are well advised to dedicate a PC as a server for each one of these tasks.

ICONS AND OBJECTS

Keyfile Desktop is very much an up-to-date, object-oriented, drag-and-drop Windows environment, populated by iconic in- and out-baskets, a "file room," and a "ToolBox." Tools consist of third-party application programs (such as a word processor and a spreadsheet), Keyfile template-building applets (DocMaker and JobMaker, for example), and resources like scanners, fax abilities, and OCR. To access specific tools, you double-click the ToolBox, select the icon for the tool you need, and just drag and drop it onto the desktop. To use a tool, you drop a document icon onto it.

You can integrate virtually any DOS- or Windows-based application into Keyfile as a tool. Documents created by such applications automatically become Keyfile objects; documents created outside Keyfile need to be imported into the system. Keyfile also provides viewers with about 80 popular application file formats.

Keyfile closely mimics many standard office procedures. For example, you can create a "file folder" for the Friday staff meeting and neatly store in it all the documents your workgroup will need for that meeting. (Alternatively, you can leave them scattered all over the Desktop—just as in real life.) When you want to distribute the folder, all you have to do is drag and drop it onto your out-basket, selecting the recipient or distribution list from the Keyfile directory.

All Keyfile documents are kept (in compressed format) in a central "object store" on the document server; they are decompressed when called up for reading or editing on an individual's desktop. While only one copy of a given document can exist within the Keyfile system, any number of simultaneous "pointers" to that document can reside in work folders, in- and out-baskets, and file cabinets. This approach maintains orderly control over document access (only one user can modify a document at a given time, although others may view it) and minimizes both storage requirements and network traffic. This also, however, demands fairly fast PCs for the individual workstations.

▶ FACT FILE

Keyfile Enterprise Edition, Version 2.2

List price: 10-user Enterprise Edition, \$14,945; \$995 per user. **Requires:** Document Server: 16MB RAM, 13MB hard disk space, OS/2 1.2 or later. Workstation: 4MB RAM (8MB recommended), 10MB hard disk space, Microsoft Windows 3.1. **In short:** Keyfile offers both document management and workflow solutions to your daily problems. It can store documents in TIFF file format and give you copies of them without requiring you to look at the original paper documents. The tight integration of these two solutions makes solving problems easy.

Keyfile Corp., 22 Cotton Rd., Nashua, NH 03063; 603-883-3800, fax, 603-889-9259

ADAPTABILITY TO TASK

	Power	Ease of Use
Installation and setup	GOOD	FAIR
Workflow creation	GOOD	GOOD
Tracking and reporting	GOOD	GOOD
Integration	GOOD	GOOD

463 on reader service card

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Workflow Automation Software

PLANNING MAKES PERFECT

At its most basic, workflow design in Keyfile is quite straightforward. Beyond the simplest level, however, we're talking programming—which becomes more complex as your requirements become more sophisticated. Since Keyfile provides no graphical-design tool, it's a good idea to carefully map out your entire workflow process on paper before you begin implementation. For each *step* of your workflow, you'll need to choose one of Keyfile's four *step types*: FYI, Respond, Suspend (and wait for documents), and Done. Oddly, you'll also have to know the step's *prerequisites*, since part of defining a step is linking it to one of the possible outcomes of the previous step.

In our Form-Processing scenario, for example, complete applications were forwarded to a financial officer for review of financial eligibility; this person in turn sent the applications of eligible students to a faculty member for further review. Building the financial review step involved picking a step type (*Respond*, for instance), specifying possible outcomes (like *Eligible* and *Not Eligible*), and linking the step to the prerequisite *Application Complete* in the previous step. We could also set due dates, alert users if a step wasn't finished within a specified period, or notify them when it was completed.

Keyfile handled the demands of this scenario ably—until we tried to get it to make a branching decision automatically, based on a value in the application form. You *can* do this sort of thing in the current version of Keyfile, but you need to program it in Microsoft Visual Basic and run it on a separate PC. Keyfile also provides its own scripting language, KOALA (Keyfile Open Access Layer), which helps automate many kinds of repeated tasks.

Keyfile was able to automate some aspects of setting up the Collaborative Document scenario and handled ad hoc routing with ease. But it neither implements looping workflows nor truly handles version tracking.

NIFTY FEATURES

Keyfile offers features that greatly simplify certain work-routing problems. For example, if in our Form-Processing scenario

we had several clerks checking incoming applications for completeness, we could simply route the flow of work to a shared in-basket: Each clerk, working at his or her own pace, could take the next job from the in-basket, at which point no one else could access it.

While Keyfile lacks electronic form-design capabilities in the style of a Jet-Form or Delrina FormFlow, it can import forms from those packages. It also offers as an alternative a feature called Type-Matic fields. These fields can be drawn over a scanned or imported text form to contain and manipulate the filled-in information. Workers can also add comments to documents via typed notes that look like yellow Post-Its, or they can write and draw freehand using the mouse on an image-drawing overlay.

KNOW YOUR LIMITS

Rich and easy to use as the package is, there are limits to what Keyfile can do straight out of the box. If you need to design a front end that will completely isolate Keyfile from users, for example, or set up conditional branching based on data values, you'll need a program like Visual Basic or PowerBuilder. Keep in mind, however, that Keyfile is typically supplied through value-added resellers, professionals who routinely handle customers' basic setup and workflow-design problems. The ready availability of professional expertise certainly addresses some of Keyfile's limitations as an end user system, but you'll have to factor in extra costs to an already pricey product.

With its current interface and architecture, Keyfile is probably not a package we'd pick for handling very extensive or complex business processes. But for simple to moderate workflows, Keyfile has got all the right stuff right out of the box, and its document management talents are a big plus. Version 3.0, due out in the third quarter of this year, promises to be much friendlier from a design and programming point of view and more powerful from a connectivity standpoint. In the future, we'd like to see Keyfile's store and forward mechanisms reflect the kind of open-systems approach the product has taken with application software.

Lotus Development Corp.

Lotus Notes

BY JOHN HELLIWELL

Sentences beginning "Notes is..." are apt to be vague and unhelpful, because coming up with a concise definition of the ground-breaking groupware product from Lotus Development Corp. is next to impossible. More helpful are sentences starting with "Notes does..." We're pleased to report that Lotus Notes, Release 3.0, does workflow.

The product combines a flexible, multiuser, document-oriented database structure with e-mail and a modest macro-programming environment—all highly useful in constructing workflow applications. It also adds sophisticated access-control features and the ability to build action buttons directly into Notes documents, a combination that helped it run through our workflow scenarios with no compromises.

Unless you're the first Notes user in your company, you're unlikely to have to

FACT FILE

Lotus Notes, Release 3.0

List price: Group Pack (includes server software and a 9-client license), \$4,950 **Requires:** 120MB hard disk space (300MB recommended), 12MB RAM (16MB recommended), OS/2 1.3- and 2.0-supported display, DEC PathWorks 2.0 for OS/2, IBM Extended Services 1.0, IBM LAN Server 2.0, IBM OS/2 Extended Edition 1.3 with LAN Services (LAN Requester and LAN Server), Microsoft LAN Manager 2.0 or later, NetWare Requester for OS/2 1.3, OS/2 1.3 and 2.0 or later, VINES 4.11 and 5.0. **In short:** Workflow is one of the many things that Lotus Notes is good at. Its moderately good forms-design tools and text-oriented databases are well suited to describing and containing the loosely structured records typical of workflow applications. Notes has a decent macro language and allows macro code to be embedded in buttons, so users can easily invoke the macros that move a workflow forward. Application designers can easily manage who does what in the course of the workflow.

Lotus Development Corp., 55 Cambridge Pkwy., Cambridge, MA 02142; 800-343-5414; fax, 617-693-1299

SUITABILITY TO TASK

	Power	Ease of Use
Installation and setup	GOOD	FAIR
Workflow creation	GOOD	FAIR
Tracking and reporting	GOOD	FAIR
Integration	GOOD	FAIR

464 on reader service card

Workflow Automation Software

install the product: That's typically the job of some central Notes support organization. If, however, you do find yourself setting up the first Notes system in your company, think ahead and take your time. Read the documentation—all of it—and keep the tech-support number handy. It *can* be done. The price for the Group Pack (server software and nine client licenses) is \$4,950; each additional workstation is \$495.

WORKFLOW FEATURES

Notes can be broken down into three main elements: routing and processing features, security and control features, and the product's basic database architecture, all of which can be brought to bear on the task of building workflow applications.

Unlike that of a "standard" database manager, Notes' database architecture is designed to be equally adept at handling tightly structured fields (like phone numbers and dates) and documents (free-form, richly formatted text). Notes is also an OLE client application, which means

that OLE objects, such as spreadsheets and graphics, can be embedded directly into Notes documents and viewed or edited simply by double-clicking. We used this feature in our Collaborative-Document scenario.

You define the structure of a Notes database by creating an input form that contains labels and field definitions. Notes' form-design interface is clumsy and old-fashioned. You can't drag and drop fields to different locations on the form; you have to cut and paste. Also, drawing boxes is tedious, and familiar Windows conventions like drop-down lists are not available to the forms designer. Nonetheless, controls like radio buttons and check boxes are available to help organize a form's layout.

While a form is used to enter a record (or *Notes Form*) into a Notes database, that record is not bound to the form used to create it. In our Form-Processing sce-

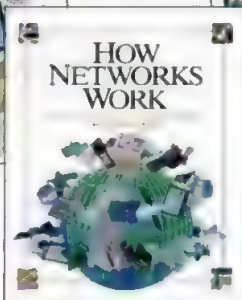
In Lotus Notes, you can apply access controls to sections of a form to prevent users from editing section data or pushing section buttons.

nario, for example, we captured all the data about a student's financial-aid application in a single document but displayed it to different participants in the workflow through a variety of forms. Professors, for example, only saw the small fraction of the data that was relevant to their evaluation of the student; financial officers saw only the financial data.

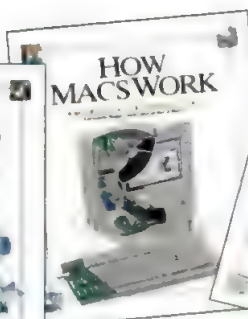
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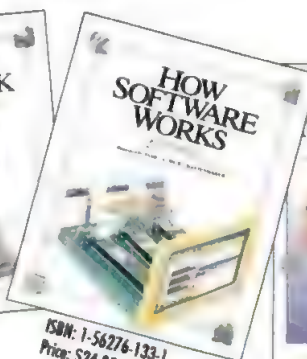
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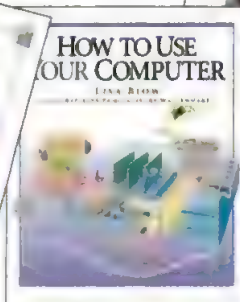
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CIRCLE 048 ON READER SERVICE CARD

NEWS IN VIEWS

Notes shows you what's in a database through *views*—dynamic reports listing all (or a formula-controlled subset of) the records in a database. A view consists of data columns, in which the designer can either simply display a particular data field from each record or use a formula to display something else. (For example, we stored the student's name in two fields but displayed it in one using the column formula "StudentLastName +", "+ StudentFirstName".)

As a single Notes database can contain many different document types, so a single view can display more than one type. We took advantage of this in the Form-Processing scenario, in which we were able to display in a single view both a student's application and various attachments that carried scanned images of supporting documentation.

While Notes isn't a relational database per se, there are ways to relate one record to another. One is via a *response document*, a record-numbering reference that attaches one document to another (most often to connect the responses in a discussion database to their main topics). In our financial-aid-form workflow, we used it to hook the scanned images of supporting documents to the main form. Another way to relate records is via *lookups*, through which a form in one database can grab data from a different document in the same database, a different Notes database, or an external database by means of Lotus's DataLens drivers. We used a lookup in the main financial-aid form to generate a pick list of current faculty members from data stored in another database. In our Collaborative-Documents scenario, a lookup pulled the images of the components of the document (spreadsheet, chart, text) into the master compound document.

FLOW CONTROL

In a Notes environment with many different users accessing many different databases, it's important to have methods for controlling access to databases and documents that can be fine-tuned to the needs of each application. Notes' built-in security and control features proved invaluable in building our test workflows.

Notes offers access control at several

levels: the database, the form or view (only the admissions department sees the view listing pending applications, for example), the document (only the professor designated as reviewer of a specific student's application can see that application, say)—even down to different sections of the same document. Access can be controlled according to system-defined groups or individual users.

Notes is unquestionably capable of handling complex and efficient workflow applications—for any developer who is able and willing to do the work.

A workflow environment also requires mechanisms for moving the workflow objects from stage to stage. Notes provides this in three ways: It integrates e-mail with database functionality (both for notification and moving documents around), implements good version control for documents that go through multiple edits, and uses a fairly powerful macro language.

NotesMail is tightly bound to Notes' database structure. Accordingly, any Notes database can be mail-enabled. In a workflow, NotesMail is typically used either to notify participants that something awaits their attention or to transport documents from one workflow database to another. The two can also be combined, as we did in our testing. The financial-aid form itself was mailed to the professor whose input was required, whereupon the professor added the necessary information and—again using NotesMail—routed it back to the financial-aid department. Notes' mail capabilities are invaluable when some participants in the workflow are remote users who connect to the Notes network via phone lines.

Notes' version-control prowess makes it a natural for many collaborative-document-style workflows. Any Notes form can be enabled for version control to ensure that each time a document (or any ob-

ject embedded in it) is edited, a new iteration of the document is generated and the old version kept "on file." Notes automatically tracks who made the changes and the time and date that they were made.

MACRO AS A SECOND LANGUAGE

The Notes macro language is a frustrating creature, with maddeningly inconsistent syntax and behavior, but it is nonetheless a powerful tool. Building a Notes macro is a technical challenge of about the same order as building a 1-2-3 macro, but as with 1-2-3 macros, adept users can do surprisingly sophisticated tricks.

The language has a core of 120-plus @ functions for simple operations such as manipulating strings; converting data-types; returning current time, date, or database names; and testing the state of the current document. More complex @ functions can send mail messages, do lookups from other Notes databases, and manage sessions with DDE server applications.

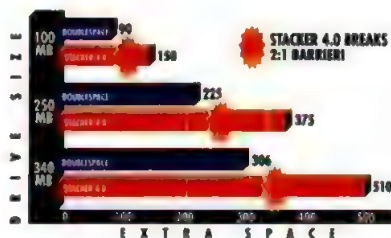
Macros can be executed via menu commands or attached to buttons on forms or documents and executed by means of a mouse click. For example, we put buttons labelled "Complete—send on" in each section of the financial-aid form and set up access controls so that only the people who were authorized to add information to that section could push the section's button.

The Notes macro language lacks a useful debugger. It also lacks robust program-control structures (like loops), clearly declared variable types, and the ability to act on a collection of Notes documents. But none of those limitations were really felt when we were building our workflow applications. We were able to create both the Form-Processing and Collaborative-Documents workflows as pure Notes applications with minimal compromise.

Notes does not offer workflow builders the easy-to-use graphical design tools found in some dedicated workflow packages, nor does it provide the highly sophisticated reporting and analysis features that are part and parcel of high-end production-oriented workflow systems. It is, however, unquestionably capable of producing complex and efficient industrial-strength workflow applications—for any developer willing to roll up his sleeves and do the work.

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CIRCLE 081 ON READER SERVICE CARD

Workflow Automation Software

Microsoft Corp.

Microsoft Electronic Forms Designer

BY JAMES KARNEY

Microsoft Electronic Forms Designer (MEFD), Version 1.0, is not for those searching for turnkey solutions. This \$395 package is, however, an excellent option for organizations that use Microsoft Mail and have the ability to develop Microsoft Visual Basic workflow applications.

Essentially, MEFD is a Visual Basic toolkit and set of runtime libraries for producing and using e-mail forms. MEFD contains both source code (which runs the message routine) and its associated forms. It makes use of special links to MAPI so that a form appears as a custom message to the user. This reduces the actual network traffic from the entire document to the content of the form. Any user with access to the runtime files can use an existing form, without needing an individual license for an electronic forms package. This approach makes MEFD a very cost-effective solution and—for companies with Visual Basic programming resources—the least expensive program in the lot by far.

DESIGN TEMPLATES

A designer starts with MEFD's Generic Template, which includes standard send

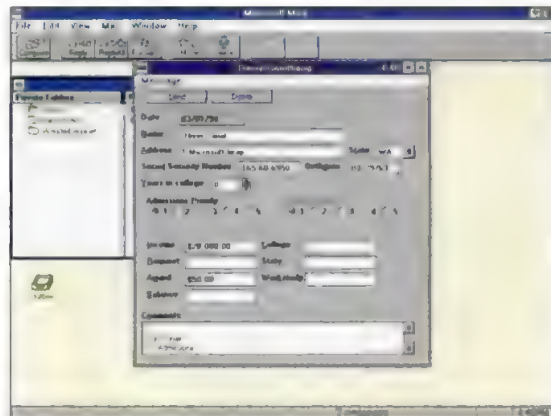
and read functions and the code required for message administration. There are two other templates in the package: a routing slip and a telephone message. The latter can also act as an auto-dialer if there is a modem on the system that is set for Windows operation. An add-on product, Microsoft Workgroup Templates (\$39), offers 13 additional samples that can serve—in lieu of the Generic Template—as the basis for new forms.

We started working through our Form-Processing scenario by renaming several of the existing fields in the Generic Template and adding radio buttons to handle tasks that had to be handled during the workflow. We coded different views for composing, reading, and forwarding the message. In order to pass data from one address to another, we had to tag each field with a different name. We used MEFD's global variables to store the name of the form's current user and originator. Also, we set up the application so that a confirmation was sent noting progress at each step. And once the basic facts on the form were checked by the registrar, we had a confirmation letter automatically sent to the student to inform him or her that the application was complete, or that additional items had to be submitted.

The time it takes to produce a form, and the elegance of any operation, is directly tied to the skill of the programmer. For example, setting up the financial-aid form was about a day and a half's worth of work for an experienced Visual Basic developer. With the finished product, we could easily track the status of the approval process, and link the workflow to related tasks like internal memos and external correspondence.

While projects can be designed using Visual Basic Professional 2.0, there is much greater flexibility available with Version 3.0. Version 3.0 provides built-in support for any ODBC-compliant database and contains the actual Microsoft Access engine. A skilled programmer can easily add links to live databases and spreadsheets using data-access control or direct ODBC (Open Database Connectivity) or SQL calls. An MEFD applica-

tion can act as a DDE server and both OLE server and client. This allows for intermediate actions in a workflow, such as updating a spreadsheet or outputting a hard-copy notice using external applications. For example, we set up live links to both Microsoft Excel and Microsoft Word for Windows easily. We were able to link an approval or denial letter to a form by selecting a radio button.



Microsoft Electronic Forms Designer has good controls for tracking forms and workflows, but only a Visual Basic expert can make the most of the package.

IN GOOD FORM

There are actually two forms that have to be created and contained in each application: one for composing, used by the sender, and another for the reader's reply. As with other Microsoft Mail messages, the user can attach additional files. MEFD has prewritten code that makes extensive use of MAPI—and the 12 functions known as Simple MAPI—to control messaging tasks.

Once the application is satisfactorily coded and tested, it is compiled as an .EXE file. The Microsoft Mail administrator must register the complete application on the system. To make the form available to end users, the administrator can store copies on local hard disks or place them in a central directory.

Anyone within the Microsoft Mail Post Office with access privileges can use the MEFD Browser utility. The user chooses a form, fills out the appropriate fields, and routes it. Our Form-Processing scenario revealed the ease of messaging: Each recipient obtained the form as a regular e-mail message. There was no need to set attachments.

We blocked both read and write access to portions of a form by adjusting the

FACT FILE

Microsoft Electronic Forms Designer, Version 1.0

List price: \$395 (includes runtime module); Microsoft Visual Basic 3.0, Professional Edition, \$495 **Requires:** 4MB RAM, 1.2MB hard disk space, Microsoft Windows 3.1, Microsoft Visual Basic 2.0 or later **In short:** Microsoft Electronic Forms Designer is more a Visual Basic toolkit than an application. As long as you have good programming skills, you can create custom forms that are well suited for use with Microsoft Mail.

Microsoft Corp., One Microsoft Way, Redmond WA, 98052, 800-426-9400, fax, 206-936-7329

SUITABILITY TO TASK

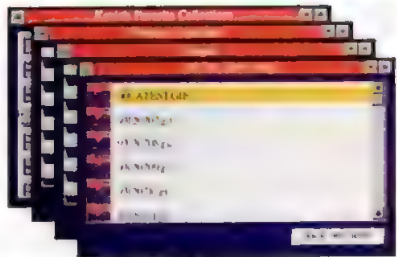
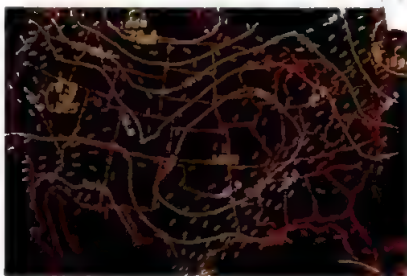
	Power	Ease of Use
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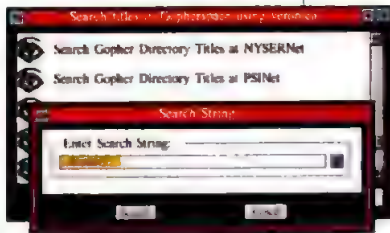
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GRAPHICAL INTERFACE FOR THE INTERNET
CIRCLE 858 ON READER SERVICE CARD

Workflow Automation Software

properties of individual fields. MEFD lacks some of the more advanced security tools, such as public and private key-locking, but third-party utilities are available to extend the feature set.

MEFD is crafted to fill a very specific niche market: Microsoft Mail shops willing to spend the time and money required to design forms applications in Visual Basic. There are no built-in tools for easily creating complex workflows. But if you are a Visual Basic programmer who is comfortable with e-mail systems, and your firm's needs are in line with the scope of your programming skills, MEFD offers a low-cost solution. It may well become your postmaster general.

Portfolio Technologies Inc.

Office.IQ

BY ALFRED POOR

In giving users powerful tools, Office.IQ, Version 1.07, forces workgroups to look at procedures not as systems to be automated but as processes to be facilitated. The package works best if you want users—not computers—to exercise control over how items are processed. Office.IQ is \$4,950 for ten users and \$2,475 for five users.

The program lets users create and manage information using any Windows application—spreadsheet, document, sound, or graphic. Users create workflows that guide information—but do not force it to move—along predefined routes. Furthermore, users can always choose among available routes, or even

make ad hoc decisions to ignore the defined flows entirely.

INSTALLATION

Office.IQ includes an administrator's program for setting up users and assigning *privilege levels* (Office.IQ's term for security assignments). In order to work with files in Office.IQ, you must have both the necessary NetWare rights and Office.IQ privileges.

You install the administrative program on a NetWare server and copy the end-user files onto the server. You can then use the NetWare Bindery information to set up user and group lists. Since you can send objects to users outside of the Office.IQ system through a fax transmission (e-mail support is planned for Version 2.0), you can also define users that are not included in the NetWare Bindery.

The end-user program can be run from the server (for diskless workstations) or a workstation's local disk (for better performance).

LET THE WORK FLOW

Windows applications files are stored as objects in the program's central database, where they are automatically condensed (to save space) and encrypted (for security). When you open the object, Office.IQ automatically launches the associated Windows application. You can create a new object by importing a file or by copying an existing object.

Many users can view an object's contents simultaneously, but only one user at a time can revise it or "check it out," thanks to Office.IQ's file-locking feature.

Version 2.0 of the program, in beta during our testing phase, will have a "briefcase" feature that will let a remote user check out objects.

You can import an empty file—such as an empty Word for Windows document—as an object, and then set it up as a template on the Template Bar. Since you can create an object using that template and launch its associated application (Word for Windows, in this example), users can rely on Office.IQ as a Windows desktop.

Another type of object is a

FACT FILE

Office.IQ, Version 1.07

List price: Five-user version, \$2,475 **Requires:** 4MB RAM (6MB recommended), 6MB hard disk space on workstation, 40MB on server, Windows 3.0 or later, NetWare 3.x running MHS **In short:** Office.IQ, which offers a flexible, powerful Windows environment, gives you broad control over Windows applications files and their routing among users; it also allows for the creation of flexible ad hoc workflows. On the other hand, Office.IQ does not use rules-based workflows and has no applications of its own.

Portfolio Technologies Inc., 5600 Mowry School Rd., Newark, CA 94560, 510-226-5600, fax 510-226-8182.

SUITABILITY TO TASK

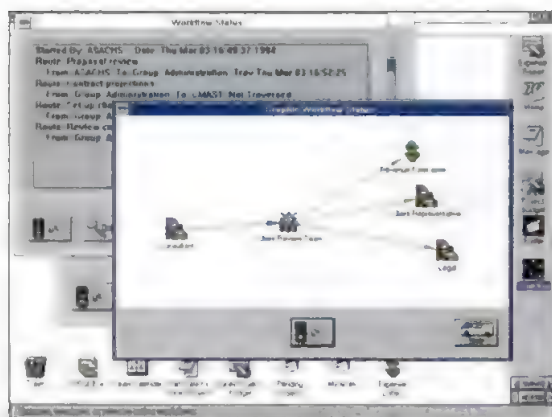
	Power	Ease of Use
Installation and setup	GOOD	GOOD
Workflow creation	FAIR	GOOD
Tracking and reporting	FAIR	GOOD
Integration	GOOD	GOOD

486 on reader service card

folder. You can collect multiple objects in a single folder. For example, the Jones financial-aid application folder might contain a Word for Windows document that is the student's application and an Excel spreadsheet that is an analysis of the family's financial needs. You can have that same student application included in a Freshman Application folder. Also, since folders are themselves objects, you can place folders in a folder.

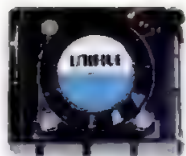
Once you have objects, you can send one to another user. (To send multiple objects, you can put them in a folder.) If you receive an object as part of an existing workflow, you can send it along the available routes. For example, if you are the admissions officer responsible for an incoming freshman, and you receive the student's financial-aid application from the financial-aid department, you can send it to any or all of the recipients. In this case, you may want to send it both to a person in the admissions department and to the person in charge of approving the aid request.

If you create a new object, you can either send it to another user on an ad hoc basis (via a one-step routing that is essentially an electronic-mail function) or use it to start a workflow that you create from an existing workflow template. For example, if you are the person who receives the incoming financial-aid applications, you



Office.IQ users can check the status of an existing workflow in either text or a graphic. Blue lines show traversed routes; red lines show unused routes.

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Workflow Automation Software

might have a typical route for distributing new applications. But in some instances, you might want to send an application directly to the director of the financial-aid department for a special review first.

CREATING A WORKFLOW

Workflow templates are created graphically, by dropping icons of individuals or groups on a workspace and then creating connecting routes between them. Recipients can be connected in one-to-one, one-to-many, many-to-one, and many-to-many patterns. Since each route can be traversed only once in a workflow, you cannot create an infinite loop. This means that you cannot send a document back and forth along the same route repeatedly as required by our Collaborative-Documents scenario; you would have to either use ad hoc messaging or start a new workflow each time a document were sent back to the beginning. Recipients can be identified by user or role, making workflows easy to modify should personnel assignments change.

There is no rules-based intelligence in workflows. When an object arrives at a node that has multiple routes attached to it, the user at that node can send the object along any or all of the routes. Some workgroups will want this level of freedom; others will want more intelligence built into the package.

The only notification Office.IQ provides is that you have received an object. But any user can check on the status of a workflow (provided he or she has sufficient rights and privileges) using graphic or text displays.

A RICH ENVIRONMENT

While Office.IQ does not use rules-based workflows and has no applications of its own, the environment is rich with options for automating and streamlining work procedures. You can create custom template bars for different users or groups of users that contain templates for the most frequently used types of objects (including defined workflows). Further, there can be multiple template bars for different types of tasks. And since you can use an empty file as a template, you can also use the template bar feature to launch any Windows application.

An advantage of the program's data-

base design is that you can search the database for objects. You can use criteria such as the name of the user who created the object, the type of object (document, folder, or workflow), or the contents of a user-defined field, such as Graduation Year. Queries can be stored for reuse.

If you store a query in a folder, the folder becomes a Smart Folder, which automatically executes the query and stores the qualifying objects in the folder. For example, you could use this feature to look automatically at the Graduation Year field in financial-aid application objects and group them in a folder for all applications for a given graduating year.

Office.IQ can accept images from scanners and fax modems—either local or shared. And a viewer lets you highlight and annotate the images.

FORWARD HO

If you need a program to manage a production task, where the steps are predefined and the criteria can be mechanically applied, then Office.IQ is probably not your best choice. On the other hand, if you want to give workers a powerful tool with which they can quickly and easily manipulate information using the Windows tools that they already know and use, and then route that information to others within your organization via a flexible and responsive workflow system, you might want to check it out.

WordPerfect Corp.

WordPerfect InForms

BY JAMES KARNEY

WordPerfect Corp. is no novice when it comes to electronic documents, and the company's new WordPerfect InForms, Version 1.0, shows just how much experience is worth. This \$495 workflow package offers an excellent designer module, robust security features, and word processing extras that include a spell-checker and a thesaurus. While there are some rough edges in this first release, it should easily engender a devoted following, especially in organizations that are already using WordPerfect Office. This package is compatible with MAPI, VIM, and WordPerfect Office mail services.

Like most form packages, there are

two components: a designer for creating forms and a filler to actually use them. The designer, which makes full use of the Windows interface, is as sophisticated as any of the other form-based products. There are menus, a button bar, and a movable tool bar that offers access to forms elements. The tool palette lets you quickly add tables, drop-down lists, radio buttons, data entry boxes, and even bar codes. Any part of a form can be defined as an object and saved for later use. The only drawback we found during testing was a moderate drop in system performance when working with a large number of objects on-screen.

ALWAYS CALCULATING

While InForms lacks a macro language for setting up routing and data entry requirements, it comes with over 130 calculation functions that can be applied to forms and linked to external databases. You can combine any field within a form with a function to indicate the next recipient of the completed form in the workflow; this capability made it easy to route the financial-aid form in our Form-Processing scenario. It was possible to build some control into a predetermined workflow—to have a workflow automatically rerouted, for instance, on the basis of an applicant's last-term grades. If the num-

► FACT FILE

WordPerfect InForms, Version 1.0

List price: \$495 (includes designer and filler); additional fillers, \$99 each (includes license only and no documentation); five-user version, \$1,425. **Requires:** 4MB RAM, 12MB hard disk space, Windows 3.1. **In short:**

WordPerfect InForms makes a very strong showing for a first release, with outstanding design tools and first-rate security and data-manipulation tools. WordPerfect needs to add DDE and OLE support, and to provide an easier way to integrate workflow commands, specifically via a macro language. Despite those shortcomings, however, this product looks and works like a winner.

WordPerfect Corp., 1555 N. Technology Way, Orem, UT 84057; 800-451-5151; fax, 801-228-5077.

SUITABILITY TO TASK

	Power	Ease of Use
Installation and setup	GOOD	FAIR
Workflow creation	GOOD	GOOD
Tracking and reporting	FAIR	GOOD
Integration	GOOD	GOOD

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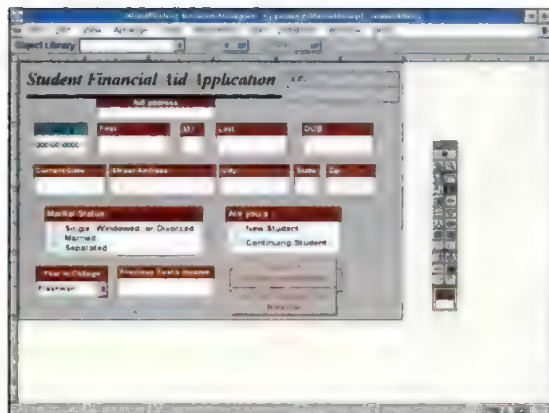
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Workflow Automation Software



You can use the calculation functions in WordPerfect InForms to control the movement of forms and messages and work with the data contained within them.

bers in the database changed, the number changed in real time. Further, we used statistical functions to create complex workflows based on the contents of the data repository. For example, we altered the approval requirements based on average income or grades of all applicants. But it was impossible to automatically bypass a person who was not available for a set period of time.

ABOUT THE ROUTE

Forms are stored in a proprietary file format, and the data held in a form is deposited in a database. This setup provides flexibility. With regular forms, a user sends the form, and the recipients fill in the blanks and return the form. The content is based solely on the receiver's modifications. Another approach makes use of InForm's form-transport technology; the information in the form is a live link to the information in a referenced database repository. Assuming the people on the form's route have access to the database, any modification of the form will automatically modify the contents of the database.

Informs ships with Microsoft Access drivers, and it can read and write directly to 17 databases. It works with a multitude of databases that support ODBC with the purchase of drivers at an extra cost. To route our test forms, we used both calculation functions and dynamic links. Links are easy to set up via a drop-down menu. For our financial-aid form, we linked several blocks to a live database and changed their values as the form traveled. The database and the form were updated, pro-

viding all users on the network with real-time updates as the form made its rounds.

The ability to set routes via alias—such as "CFO" instead of "Jane Doe"—and group names lets you adjust the list of recipients without having to modify a form. It let us see the workflow more clearly: We identified participants not by name but by department or function.

When it comes to security, InForms is one of the best products in its class. It provides not only message encryption but also its own type of RSA electronic signatures, called TamperSeals,

which are well-designed for workflow applications. These offer a secure method for authenticating activity or approval. You can also establish priorities for signatures on a given document by giving users number rankings. Higher numbers can override actions of lower numbers, and an audit trail can record the activity.

There are outstanding controls for both on-screen and printer versions of a form, which makes it easy to match paper-based copies closely. Resizing, moving, and modifying the attributes of objects in a form can all be handled with a mouse. On the whole, the form-creation process went quite smoothly during testing.

WordPerfect has entered the electronic forms market with a strong showing, and there is a lot to like about InForms. Its design tools, security features, and conditional controls are first rate. But even though the calculation functions are powerful tools, a simple command or macro language would make it easier for nonprogrammers to define and manage workflows. The addition of a reporting capability on workflow status would be a plus, given the product's potential for managing enterprise communications. On the whole, if you consider InForm's robust feature set and WordPerfect's recent merger with Novell, this package is definitely one to watch. If you already rely on WordPerfect products, InForms is worth serious consideration.

Reach Software Corp.

WorkMAN

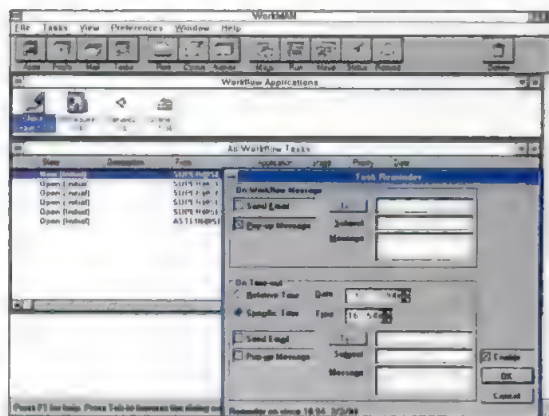
BY JOE SALEMI

Reach Software Corp.'s WorkMAN, Version 1.1, is a capable but sometimes frustrating workflow management program. It consists of two programs: WorkMAN Tools, the workflow design package, and WorkMAN, the user front end. The former is \$3,995, which includes training and a year of support; WorkMAN is \$2,495 for a five-user package and \$1,495 for additional five-user packs.

WorkMAN provides easy access to workflow applications through a button bar, icons that represent the applications, and an e-mail-like screen that shows pending, open, and completed tasks. There are no built-in optical character recognition (OCR) or fax capabilities; you can link with third-party utilities through DDE or these functions.

INSTALLATION

Installing WorkMAN is fairly straightforward, but you must install everything in the proper order. First you install a supported e-mail package on your network: Banyan's VINES, Lotus's cc:Mail, or Novell's MHS. We used Novell's Basic MHS. (Reach also has a version of WorkMAN that runs with Lotus Notes—see the sidebar "Lotus Notes and Its Add-Ons"—and is developing one for MAPI mail systems.) You then make sure that every WorkMAN user has an e-mail mailbox; if you're using MHS, you must specify WorkMAN as the preferred MHS ap-



In WorkMAN, icons represent common actions and applications; a list shows the status of workflow tasks. You can set reminders about unfinished tasks.

Workflow Automation Software

plication for each user before installation.

The next step is to load WorkMAN on each workstation. Installation of the user software is a simple matter of swapping disks and specifying the user's log-on ID, the e-mail system used, and the hard disk location for the software.

The next and final step is to install WorkMAN Tools on the application developer's workstation. The system administrator then uses the WADMIN utility to set up user accounts, work domains (groups of users who share common applications), applications, role tables, and status-tracking databases. WorkMAN uses role tables as a way of specifying a list of one or more users who receive items in a workflow; common examples are the Sales Department role or the Accounting role.

Reach Software requires WorkMAN users to purchase annual maintenance and support packages; it's \$375 each year for the base five-user package, \$225 each year for the add-on user packs, and \$595 for one WorkMAN Tools license. The maintenance agreement includes telephone support, bug fixes, and product updates.

DESIGNING WORKFLOWS

Once everything is set up and running properly, the developer uses WorkMAN Tools to create a workflow; the package uses graphics to build and represent a workflow. First you click on the workflow screen, which creates the first task point in the workflow process. Further clicks create additional workflow processing points, which the developer then links by drawing a line with the mouse from the starting point to the next step in line, and so on to the end. You can choose to keep a particular work item at the same point until the specified task actions are completed.

You then create the forms—the heart of a workflow—via the Forms menu. WorkMAN's forms act like e-mail messages, containing the data and tasks involved in a workflow. It's the form itself

that moves through the WorkMAN system. Forms can include custom menus, buttons, and fill-in-the-blank fields. WorkMAN's forms capabilities aren't as sophisticated as those provided by a forms package; for example, WorkMAN lacks drawing capabilities and doesn't support imports from OCR scans of paper forms. But if you need more detailed and extensive forms, you can integrate Work-

MAN forms with forms from one of the common forms packages, such as Delrina Technology's PerFORM Pro.

WorkMAN has a fairly complex scripting language that's used to create routing rules and manage other workflow processing. The basic workflow routing scripts are created

when the workflow and the related forms are designed. These scripts can be modified to provide more sophisticated routing: You can program where a form should go based on the value in one or more form fields, or based on what actions have been taken by users along the way. A number of script templates and sample scripts are provided to make this programming easier.

WorkMAN stores the data entered into the form with the form itself; if you want to store the data in an external database, you have to write a script that reads the data from the form and appends it to the database. Writing such a script requires experience in both database and WorkMAN programming. WorkMAN uses the Paradox database engine for managing and storing the data. The developer package includes a three-day training class—with emphasis on the script language—and a year's worth of technical support.

Once a workflow application is completed and debugged, the system administrator makes it publicly available to the WorkMAN users in a work domain. The users then add the application to their local WorkMAN desktop.

USER FUNCTIONS AND TESTING

WorkMAN's strength is in designing and managing structured workflows, such as the

one used in our Form-Processing test scenario. The initial workflow design took only a couple of hours, and the application handled most of the routing without extensive programming. The WorkMAN user front end is easy to use and has a customizable icon bar for handling different functions, such as loading applications, creating new tasks, and forwarding existing tasks. Applications appear as icons, and workflow tasks appear in a columnar table that shows who originated the task, where the task is in the workflow, and what its status is.

Workflow documents are sent as e-mail messages to the appropriate users defined in the workflow role. Users can choose to view all current tasks or sort them into individual folders associated with a particular workflow. When the user clicks on a task, the appropriate workflow application is automatically loaded. The WorkMAN front end can also be used as a regular e-mail package.

Our only complaint about WorkMAN's interface is that it uses its own dialog boxes, which don't have all the features of the Windows Common Dialog boxes. This was particularly a problem

▶ FACT FILE

WorkMAN, Version 1.1

List price: Five-user license, \$2,495; each additional five-user license, \$1,495 **Requires:** 4MB RAM (8MB recommended), 6MB hard disk space, EGA monitor (or better) recommended, 8514/A or 8514/A-compatible graphics card, Microsoft Windows 3.1 or later. For MHS networks: NetWare 3.11 or later, MHS 1.5 or later, NetWare Global Messaging 1.0 or later, or cc:Mail 2.0 or later. For VINES networks: VINES 4.10 or later; VINES mail service (all versions) or cc:Mail 2.0 or later. **In short:** WorkMAN is a decent midlevel workflow application that is designed primarily for fixed-step processing. It's somewhat limited in its ad hoc capabilities, but it can generally be interfaced easily with other Windows applications to make up for what it lacks, and it has a fairly complex scripting language. It lacks OCR and faxing capabilities, though, and it is rather pricey considering its capabilities.

Reach Software Corp., 872 Hermosa Dr., Sunnyvale, CA 94086, 800-624-5356, 408-733-8685; fax, 408-733-9265.

SUITABILITY TO TASK

	Power	Ease of Use
Installation and setup	4.0	4.0
Workflow creation	4.0	4.0
Tracking and reporting	4.0	4.0
Integration	4.0	4.0

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with the dialog boxes used to open files. There's no easy way in WorkMAN to navigate among directories; the dialog boxes lack the standard ".." symbol used to move up the directory tree. In order to change to a completely different directory tree, you have to type the complete path into the dialog box. Since all WorkMAN users have to use this dialog box to access data files, this can be an annoying experience, especially to experienced Windows users. New Windows users may be confused by WorkMAN's lack of standard Windows features.

WorkMAN doesn't handle ad hoc workflows as smoothly as some packages in this roundup, and it was unable to perform most of the tasks in our Collabora-

tive-Documents scenario. There's no provision for automatically rerouting tasks when a recipient is unavailable. Still, WorkMAN can be integrated easily with a third-party Windows-based document management system that provides the document handling features it lacks. Furthermore, WorkMAN can save the last three versions of a file.

On the whole, WorkMAN is a good midlevel workflow management system. Its strength lies in its handling of structured workflow processes, though it can be used for ad hoc workflows if you use third-party applications. WorkMAN is also a decent e-mail package, so it can be used as an all-in-one package for handling both e-mail and workflows.

Others use icon-based object-oriented interfaces that can be layered into very intricate hierarchies of procedures and workflow rules. Such object-oriented approaches enable organizations to introduce workflow on a limited scale with minimum investment and risk while planning for expansion to larger workgroups and the development of larger, more complex applications.

The trend to support this type of workflow environment is evidenced in actions by many vendors such as FileNet, Recognition International, Sigma Imaging Systems, ViewStar Corp., and Wang Laboratories, who placed a heavy emphasis on object-oriented techniques and metaphors. This also speaks to the synergy of workflow with Microsoft Corp.'s Cairo and Chicago operating environments, which will be heavily influenced by object-based approaches.

High-End Workflow

Scaling enterprise solutions to the PC platform

Organizations evaluating distributed workflow solutions have traditionally faced a fundamental decision: Purchase off-the-shelf, user-oriented products that can be implemented with little preparation and little or no programming, or invest in highly customizable products that require considerable design and programming prior to installation.

READY-TO-WEAR

Many off-the-shelf products—Keyfile Enterprise Edition for example—provide some sort of graphical user interface that enables end users to easily define and modify basic workflow applications. Others, such as Portfolio Technologies' Office.IQ, Version 1.07, and Reach Software's WorkMAN, Version 1.1, go further, offering graphical definition tools for creating and depicting workflow.

While many people equate such easy-to-use products with small workgroups and low volume, this is to some extent a misconception. Volume is not as much an issue with these systems as is the nature of the transactions: Off-the-shelf products are ideally suited for applications that are limited to a well-defined set of tasks with minimal requirements for exception processing. As long as the application re-

mains relatively predictable, many of these systems can be scaled to large-enterprise environments.

Complex procedures with many exceptions, on the other hand, may exceed the scope of off-the-shelf products. Where there's a need to encompass unpredictable applications with complex paths and routing rules or rules-based transaction document processing, organizations will want to investigate the high end. The high end constitutes highly customizable products that include advanced workflow-definition tools and 4GL scripting languages, intended for use in applications that require a relatively high degree of procedural definition.

CUSTOM-TAILORED?

Still, most recent high-end entries have also attempted to "lower the bar" on the development of workflow applications, aiming at a balance between out-of-the-box and customizable functionality: Products such as Wang Laboratories' OPEN/Workflow and Sigma Imaging Systems OmniDesk seek to provide scalability through advanced job-definition tools and application programming interfaces (APIs)—in many cases, using object libraries that can be manipulated without traditional command-based programming.

UNIX WORLD

Workflow has seen most of its revenue growth in what we might call the "high high end" of the market where Unix dominates. (Over 90 percent of all workflow products require Unix servers!) The leading products in this market segment are the "household words" of workflow:

- **OPEN/Workflow**, from Wang Laboratories (800-639-9264), runs under AIX, HP-UX, and Wang RISC, with APIs to numerous other operating systems. It boasts advanced graphical development tools and reporting tools: Along with user-defined reports and queries, work processes can be continuously redefined and optimized by monitoring process efficiency and graphically modifying the workflow. The product also includes a toolkit with precoded business metrics, such as time/cost benchmark tests.

- **Plexus FloWare**, from Recognition International's Software Division (800-999-5910), runs under many flavors of Unix, including AIX, HP-UX, SunOS, VS, and others. FloWare's strength is its support for multivendor, open environments. The product offers an icon-based diagramming tool for depicting business processes and adheres closely to an object-oriented model, including support for object-library integrity. (That is, changes made to shared objects are automatically replicated in all process models.)

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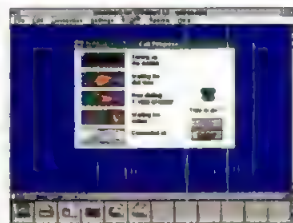
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• **WorkFlow**, from FileNet Corp. (800-345-3638), has led the imaging and workflow market for a number of years. Once a complete hardware and software system, WorkFlow now ships as a software-only solution for Unix platforms (specifically, AIX and HP-UX) and provides both an object-oriented graphical development environment and a low-level scripting language.

ON THE INTEL SOAPBOX

While Unix-based workflow will undoubtedly continue to flourish, the trend is clearly toward the availability of high-end product functionality at the workgroup level. This will require the advent of products that run on Intel-based servers and clients running under Microsoft Windows or OS/2. It will also provide more options for workflow evaluators. For the time being, however, here are the products to consider if you are planning for a PC-based client/server workflow solution.

• **Automated Process Manager**, from IBM Corp. (800-935-6647), provides high-end, enterprise-wide workflow management solutions. This package is marketed as either a turnkey solution or (more frequently) a product/service bundle, and complete system prices can exceed \$10,000 per seat, though the average price per seat ranges from \$500 to \$1,500.

Workflows are defined using a graphical interface with predefined icons and a building-block metaphor. From within this interface, process and routing logic, including conditional splits, are defined using C or REXX, the industry-standard OS/2 scripting language. Automated Process Manager uses Shared Variable APIs to invoke native applications on the client workstations. For example, one user can be entering data into a SQL database while another is simultaneously viewing the data within a spreadsheet. This allows workflows to share data with multiple applications and to run independent of any host environment, such as an image or database server. This architecture provides for multi-LAN support, data independence, and scalability. Automated Process Manager also integrates with commercial e-mail packages that support the VIM standard. E-mail support is an increasingly important direction

for the workflow market and will soon become a standard for workflow products. With the variety of e-mail standards available (MAPI, MHS, VIM), it is not likely that a single workflow/e-mail standard will be adopted. The package requires OS/2 LAN Manager (or TCP/IP with Unix server); there are OS/2 and Unix versions of the server and clients.

• **FlowMark**, from IBM Corp., (203-262-5238), is one of the better examples of object-oriented workflow management. Using *polymorphic* workflow objects managed by a proprietary object-oriented database (ODB), FlowMark can handle any file format, including images, native-application formats, or even multimedia presentations.

FlowMark uses a standard set of object-oriented functions, including encapsulation (the ability to nest multiple procedures into a single process object) and object reusability (the ability to replicate objects with identical or one-off—slightly modified—functionality). An example of encapsulation would be the workflow object `Print_Document` that includes the procedures `Get_Page`, `Format_Page`, `Find_Printer`, `Send_Page`, and `Print_Page`. The resulting Print Document icon can then be stored as an object in a procedural library for possible reuse and recombination.

Process logic and workflows are defined using a graphical diagramming module that consists of two components: icons for building diagrams; and *notebooks* or data stores, which contain specific process details. Notebooks include details on the assignment of activities—to either specific users or workgroups—as well as user documentation describing specific actions and how they should be performed. Also included can be criteria for process completion or thresholds for lapsed activity time, both of which can either prompt the user or forward the document to the next step in the workflow. Once defined, workflows can be pretested using a built-in animation module, similar to that provided by TASC-Flow (below). FlowMark requires OS/2 LAN Manager; the server and client are OS/2-based.

• **KI Shell, Version 1.2**, from UES (614-792-9993), provides object-oriented workflow management independent of any end user application. With an ap-

proach that is similar to that used by FlowMark, KI Shell uses polymorphic objects to manage logical folders of native-environment documents. KI Shell objects, called Assistants, are defined using a graphical interface and a library of reusable functions. These functions, which form the System Integration Library, are common document and folder functions, such as Create and Delete. New functions and additional process logic can be programmed in C and integrated using the Rulewriter development tool. APIs and integration with existing databases are used to store process and routing logic.

While KI Shell is best suited for high-volume, transaction-oriented applications, it does support ad hoc (point-to-point) routing. In fact, one of its most unusual and interesting abilities is to store data gained from point-to-point transactions and later use that information to assist in the development of system-wide routing. While the product is able to integrate PC clients with high-end Unix systems, the development environment is much more complicated than those found in most PC-only, low-end workflow packages. The package requires OS/2 LAN Manager (or TCP/IP with Unix server). There are OS/2 or AIX versions of the server, and OS/2 and Unix versions of the client.

• **Navigator 2000/Workflow, Version 2.07**, from ILevy & Associates (314-822-0810), is the workflow management component of the DMS 2000 family of imaging products, and it is not intended to run independently. Workflow scripts are defined using a relatively limited set of diagramming tools, with predefined icons based on functions—such as Print or Scan—within the DMS 2000 imaging and document management modules. Routing schemes can be either predefined or designated by the user for ad hoc workflow. Point-to-point, or ad hoc, routing can also be disabled at the system level, allowing administrative control over routing and document security. The administrator can also view users' queues and audit trails, as well as assign security and priorities for users, document types, and individual documents.

Navigator 2000 integrates with standard SQL database systems including Or-

Workflow Automation Software

acle, Gupta, and Informix. The package requires NetWare, VINES, or any NetBIOS-compliant system; there is a Windows and a Unix version of the server, and the client is Windows-based.

• **OmniDesk, Version 2.21**, from Sigma Imaging Systems (212-476-3000), is an enterprise-wide workflow management solution. A company whose workflow software is well suited for high-volume, transaction-oriented applications, Sigma represents some of the largest workflow installations in the industry: Some exceed one thousand users.

A unique and heavily emphasized aspect of OmniDesk is its patented system redundancy. While most high-end workflow products employ a client/server architecture, OmniDesk uses a single *logical server*, consisting of multiple physical servers. Within this model, the physical servers are organized into *processing domains* where work is automatically distributed among available servers. This method, referred to by Sigma as "fail-soft" processing, means that the logical server will remain operational unless all physical servers fail.

OmniDesk's RouteBuilder defines workflows by means of an icon-based diagramming tool. OmniDesk was one of the first workflow products to use such a graphical development environment, and it's still one of the most intuitive in the industry. Routing rules are based on logical conditions and users' attributes, such as work-group name or security level. Queue profiles, which can be defined to dictate priorities at each workstep, are used to govern processing sequence. The package runs on any NetBIOS-compliant system; the server runs on OS/2, and the clients are OS/2- and Windows-based.

Sigma is also making pioneering efforts in the arena of home-office workstations with its OmniDesk AnyWare product, which is intended to provide transaction-based connectivity to home workers, a burgeoning segment of the workforce.

• **PowerFlow, Version 1.1b**, from Optika Imaging Systems (719-548-9800), is intrinsically linked to Optika's imaging product FilePower. PowerFlow does not yet operate as a standalone workflow product.

PowerFlow workflows are developed using an intuitive graphical diagramming

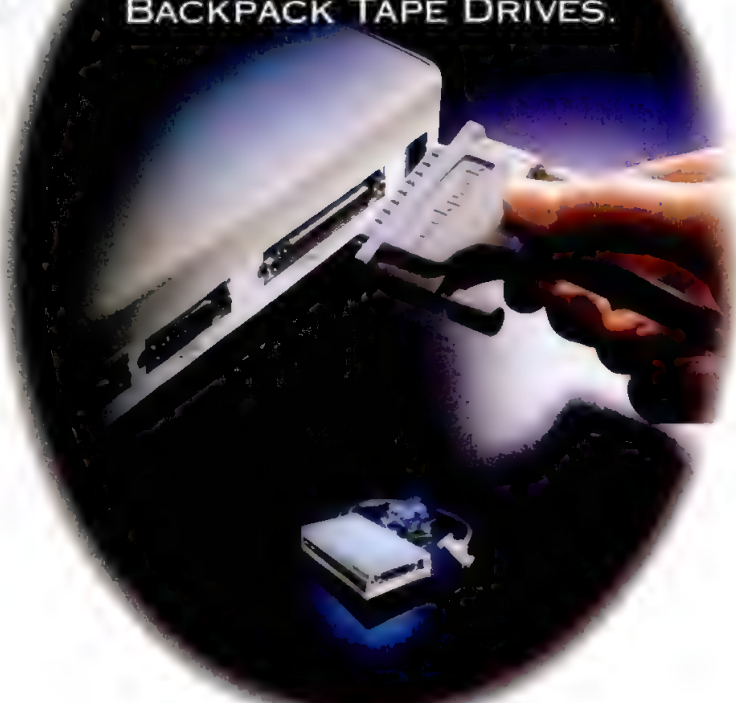
tool that consists of predefined icons corresponding to FilePower functions, such as Print or Scan. These icons, referred to as *events*, correspond to one of nine *types*: work, rule, distribute, collect, print, fax, discard, and external. The most common type of event, *Work Event*, is used to define the logic for queues, tasks, and triggers. Queues are temporary repositories for documents in process. A queue can

perform Work-in-Process, which allows documents to be processed by the first available user, or it can perform FIFO (first in, first out), which mandates chronological processing. Queues can also be set with thresholds to trigger software functions when preset conditions are met, such as the expiration of a time limit. An added capability—for organizing complex events—is the nesting of multi-

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ple tasks within a single Work Event. This creates a form of encapsulation, which simplifies the depiction of a workflow. PowerFlow also supports parallel routing, and, while it doesn't allow conditional splits, rules may be defined to determine the actual workflow path.

Integrated reporting functions, such as audit trails and workload monitors, are supplied as part of the product. An administrator function can be established, giving that person the right to reassign queues and workloads. This feature is of particular importance to transaction-oriented applications, where dynamic correction and modification of a defined workflow is typically required. PowerFlow works with standard SQL databases, such as Gupta and Sybase. It runs on Ethernet, NetWare, and VINES, and the server and client are Windows-based.

• **TASC-Flow, Version 2.1**, from TASC (617-942-2000), uses electronic folders and a document management-centric metaphor to route native-application documents automatically from process to process. Workflows are defined using the TASC-Plan graphical diagramming tool. Worksteps are coded with predefined and user-defined icons. The system determines routes, based on both logic defined in the workflow process and the attributes of connected users, such as security clearance or skill level. This method of dynamic routing implies that only qualified users have access to worksteps requiring specific expertise. It also provides a uniquely user-driven model for the workflow definition. TASC-Flow also supports parallel processing and conditional splits.

One of the more sophisticated attributes of TASC-Flow is the workflow simulation module, TASC-FlowSim. Once defined, workflows can be run through TASC-FlowSim without compilation and tested for potential bottlenecks. The simulation provides valuable information about workload, queue times, task time, costs, and throughput. These statistics can be used to benchmark-test business processes and perform iterative reengineering prior to implementation. The downside is that the simulation will, of course, be no better than the assumptions made about the process. These assump-

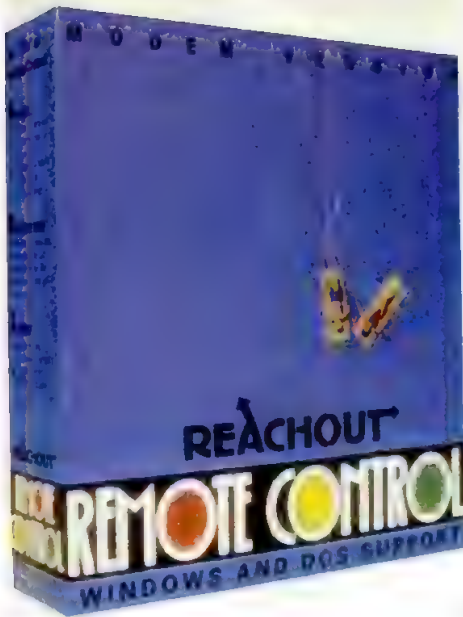
tions may, in fact, require substantial testing and validation through the implementation of the workflow system. Nonetheless, these features give TASC-Flow a unique advantage among other workflow management solutions. The package runs on any NetBIOS-compliant system; the server runs on Windows, the client on OS/2 or Windows.

• **ViewStar, Version 3.1.1**, from ViewStar Corp. (510-337-2000), is a new version of this well-known product. ViewStar, an established imaging vendor since the late 1980s, has recently repositioned itself, with the release of 3.1.1, as a provider of "business process automation software solutions" (read *workflow*). A new feature of this version is full support (including version control and check-in/check-out features) for native-application formats such as spreadsheets and word processors in addition to image formats.

A powerful feature of Version 3.1.1 is Preemptive Routing, the ability to break from structured workflow and initiate a point-to-point, or ad hoc transaction. This type of ad hoc splicing of transaction-oriented workflows allows users to address situations not considered when the route was developed. (The danger, of course, is that this may compromise administrative control of a document's whereabouts.)

Historically, ViewStar has required all complicated routing to be programmed via proprietary 4GL scripting language. By the end of 1994, ViewStar plans to release Process Architect, an object-oriented graphical process modeler for the design, generation, and maintenance of workflows. Process Architect will include a palette of predefined icons representing tasks, or modules, which consist of ViewStar code. Process Architect will offer some of the most sophisticated diagramming functions we've seen to date. One is a feature called *catch-up routing*, which lets incoming documents automatically join related folders already in process. This allows the consistency and timeliness of documents to be optimized instantaneously, whenever new information becomes available. The package runs on Ethernet, IBM LAN Manager, NetWare, VINES, or any NetBIOS-compliant system, and the server and clients both run on Windows.

—Thomas Koulopoulos
and Nathaniel Palmer □



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synchronized files between two PCs.

ReachOut has earned three major awards in the past 18 months. The latest being "Product of the Year" for 1994 from LAN Magazine. Which goes to show that ReachOut is one powerful networking tool. InfoWorld proclaimed "ReachOut offers superb screen, mouse, and file transfer speeds and provides as

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many security options as Sing-Sing. Operation is as smooth as silk." InfoWorld rated ReachOut as #1 and awarded it their Buyer's Assurance Seal. And PC Magazine UK confessed ReachOut "was the only remote control program that worked right out of the box." They named ReachOut The Editor's Choice and called it a top

notch value. The new ReachOut Version 4.0 for Windows

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Paper Trays	(std.) 250 sheet	100 sheet	250 sheet	100 sheet
	(opt.) 250 sheet	Not Avail.	250 sheet	Not Avail.
Last Price	\$599	\$849	\$799	\$1279



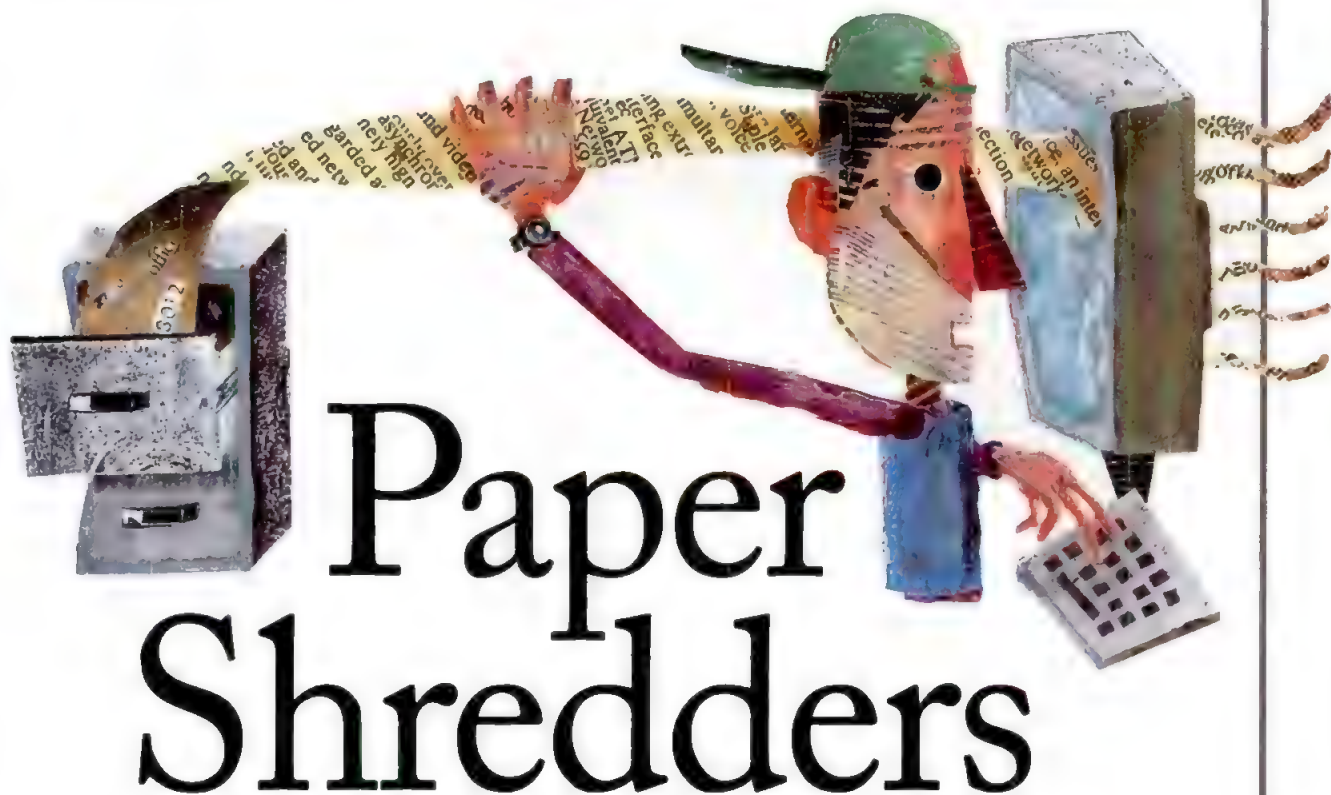
**TEXAS
INSTRUMENTS**



Suppose that $\mathcal{A}$ is a $\mathcal{C}^*$ -algebra and $\mathcal{B}$ is a $\mathcal{C}^*$ -algebra. Let $\mathcal{A} \otimes \mathcal{B}$ be the tensor product of $\mathcal{A}$ and $\mathcal{B}$. Then $\mathcal{A} \otimes \mathcal{B}$ is a $\mathcal{C}^*$ -algebra.

CIRCLE 304 ON READER SERVICE CARD

Departmental Image Management



Paper Shredders

These departmental image-management tools won't force you to change the way your office works. Instead, they can image-enable an existing PC architecture. *By Lori Grunin*

The structure of workgroups. The origin and composition of documents. Services built into the operating environment. One of these elements alone could force an evolution in document-management software; as a group, they've driven this product category to a fundamental metamorphosis. From the single-user solutions up through enterprise-wide systems, document image-management software is evolving in order to integrate itself into your actual workflow rather than forcing you to redefine the way you work.

Nowhere are these growing pains more evident than at the departmental or workgroup level, as reflected by the products we review here. In fact, simply defining these products with a two- or three-

word catch phrase is an exercise in frustration. At their most basic level, these departmental image-management products allow workgroups to bring in document images (scanned in or received via fax) and use database-like forms to assign keywords and document properties on which you can then search to retrieve specific documents—functions typically associated with traditional corporate-wide image-management systems (for more information, see the sidebar “Large-Scale Image Management”).

But these six products—Alacritty Systems' E-Quip-Workgroup Imaging; Newport Canyon Associates' Fileflo 3.5 for Windows; West-

► IN THIS REVIEW

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• File Magic Plus for Workgroups, Version 3.8

Westbrook Technologies' File Magic Plus for Workgroups, Version 3.8, stands out among these packages for managing traditional text- and image-based documents in medium-size workgroups. It has the broadest array of capabilities, including flexible, well-integrated keyword and

full-text search functions, all wrapped up in a package that is easy to use and administrate.

Honorable mention goes to Caere Corp.'s PageKeeper, Version 1.1, for its flexible search engine. Its natural language processing and weighted word searching help automate the tedious task of finding elusive documents. The lack of security—PageKeeper doesn't even password-protect the administrator's account—makes it a poor choice for restriction-conscious workgroups, but small workgroups will find the product a good manager.

Of course, as is so often the case, there were other products in this roundup that, while not matching our Editors' Choice's broad range of

features and abilities, deserve mention for their unique capabilities. ImageFast, Version 2.0, stands out for basic workflow capabilities along with a reasonable set of keyword- and full-text search-and-retrieval, and the new version (due out by the time you read this) should ameliorate some of our objections to the disjointed search interface.

Finally, lacking any way to import your existing image files, Alacrity Systems' E-Quip-Workgroup Imaging simply doesn't cut it as a general image-management tool. However, it does a good job as a standalone fax server for small businesses in which users simply need to find their own documents.

brook Technologies' File Magic Plus for Workgroups, Version 3.8; ImageFast Software Systems' ImageFast, Version 2.0; Caere Corp.'s PageKeeper, Version 1.1; and Watermark Software's Watermark Discovery Edition, Version 1.04—break with the traditional model in a variety of ways. Perhaps most importantly, they don't require that you build your work patterns around them.

Rather than act as a shell from which you create documents and launch applications, these products work in conjunction with your normal working patterns. They also allow you to work with off-the-shelf tools such as Microsoft Visual Basic and operating environment services such as OLE and MAPI for customization and workflow integration. Thus, it's no accident that they're all Microsoft Windows-based.

Finally, many of these products don't just handle images anymore; they use optical character recognition (OCR) to turn images into text for export or full-text searching, and allow you to bring word processing documents or spreadsheets into the system. In this respect, they trespass on the territory staked out by traditional document-management

software. With the lack of version control, however, these workgroup products don't encroach too deeply (for more information on document-management packages, see the sidebar "The Document Masters: PC DOCS, Saros, and SoftSolutions").

Beyond their basic functionality, however, the products in this roundup diverge widely from one other in both features and their implementation. Fileflo and ImageFast, for example, use the Raima database engine as their tracking and indexing mechanism, while File Magic Plus uses the Zyindex engine and PageKeeper's is proprietary; E-Quip and Watermark don't use databases at all. The types of documents the products handle also vary, from images only (Watermark) to any type of object at all, be it audio or visual (ImageFast).

Because TeamWorks Technologies' PaperBridge is essentially an add-on for Microsoft Access, we did not include it in this story. Nor will you find PaperClip Imaging Software's PaperClip. The com-

pany is preparing a new version for release and declined to have us include its product in this roundup.

DESIGNED TO SCALE

While we usually think of scalability in terms of the volume of documents or objects that an installation can handle, the burden of document volume and the resulting system performance ultimately rest on the back-end database. Luckily, tools such as the ODBC (Open Database Connectivity) database-access standard and database engines compliant with SQL (the structured query language) will eventually allow vendors to plug together their disparate back and front ends.

One drawback to ODBC is the performance overhead it imposes. But in exchange you attain greater integration with other types of data and greater ease of migration from one document-management system to another, all the while maintaining your original document image database. One truth remains, however: If you eventually plan to manage thousands of documents, a true database engine like what you'd find in PC DOCS Open is necessary for satisfactory performance.

If you think about the way a corporate workgroup differs from an enterprise-wide operation, then control becomes the real scalability issue. In a workgroup, all users generally need access to the same information and it's usually insignificant if some users see information they don't need. In an enterprise, however, you must be able to secure information from individuals and workgroups.

The most upwardly-scalable programs here provide all the tools you need

Our Contributors: LORI GRUNIN is a contributing editor of *PC Magazine*. STEVEN C. M. CHEN and PAULINE ORES are frequent contributors to *PC Magazine*. LANCE ULANOFF was the associate editor in charge of this story, and JEFF MACE was the project leader.

Departmental Image Management

to scale an installation up from the workgroup level to an enterprise-wide solution, without charging extra for anything except licenses for the extra seats. User- or menu-level security, advanced tools for file management and administration, version control, and support for image coprocessing boards, arrays of optical devices, and scanner and fax servers, all become important as the number of users and the volume of documents processed increases.

Keep in mind, however, that while all of these packages are installable by a qualified end user, for the most complicated and powerful programs, such as File Magic Plus and ImageFast, you will probably want to invest in the expertise of a systems integrator when scaling up to a multiple-workgroup configuration or when adding peripherals, such as server-based fax and scanning devices.

SMALL IS BEAUTIFUL

On the other hand, today's workgroups aren't necessarily large or even corporate environments. The growing number of small offices and electronically linked home offices have somewhat different needs. It's far more likely that these types of businesses need single-user programs that scale up to workgroup level. Also, if you don't share a LAN or WAN, products that don't use large, complex database engines may be more suitable; the ability to compress a directory or group of files and send it to a coworker via an on-line service such as CompuServe can in many cases be easier than exporting and importing records from a database. Other capabilities, such as batch scanning, which are commonly found in the more powerful products, are mistakenly dismissed as trivial for single users or small workgroups.

Though MindWorks' Recollect is not included in the story—the workgroup version won't be

available until midyear—the current single-user version is specifically designed with this sort of portability in mind. By the time you read this, the company will also be offering a turnkey version of the workgroup product called The Knowledge Builder, which bundles a SyQuest-compatible drive and, optionally, a scanner.

Compulink Management Center (310-212-5465) is also currently offering a free Ficus Systems LEO Scan 610 scanner with its LaserFiche MinuteFile and Executive standalone document-imaging software products. Both packages can be upgraded to Compulink's client/server NLM/Windows version of LaserFiche. Although we were unable to include this product in our roundup (its base price is over \$1,000 per user), LaserFiche NLM/Windows is a scalable system designed to run on NetWare 3.11 or 4.0. It can import and store existing document images, and includes scan, fax, OCR, and indexing abilities. (For information on other proprietary hardware-software bundles, see the sidebar "One-Stop Shopping.")

POISED FOR CHANGE

Many of the products we look at here have new versions expected to ship by the time you read this or soon afterwards. The Watermark Professional Edition,

Watermark's true workgroup product, will feature ExperVision's OCR engine, batch scanning, enhanced annotation, and the aforementioned SQL support. The new version of Fileflo will have menu-level security controls and will implement a floating-license policy (licensing by copies rather than by users). And among the slew of new capabilities in the next version of ImageFast will be further ODBC integration; incorporation of MAPI, MHS, and VIM (by treating them as nodes on your network); and Action Icons, a sophisticated method for launching external applications.

Other changes further down the road also have the potential to alter the architecture of all document- and image-management software. For instance, a group of enterprise-level vendors, including IBM, Microsoft, Saros, and SoftSolutions—have formed the Shamrock consortium to develop a standard set of APIs to make it easier to migrate and share data from document- and image-management products across platforms. Similarly, the file system architecture in Microsoft's Cairo (the next version of Windows NT) displays many characteristics of a relational database system; this could potentially change the way we access our document files.

Suitability to Task:

Departmental Image Management

For the departmental image-management solutions in this roundup to be truly useful in a small workgroup environment, they must provide a broad array of tools for entering documents into the application database, as well as strong connections to the applications already existing on individual PCs. Our three tasks tested the abilities of these products in both areas, while also addressing the administration and file maintenance that usually accompanies them. We give each departmental image-management product ratings for both power and ease on each task.

To achieve an excellent power rating on our **document input and output** task, a product must support multiple methods of adding images to the database. Strong performers can attach a

fax or fax server to input and output images, import existing image files, and print out the documents. Products rating high in ease of use generally offer seamless integration with the hardware and the operating environment.

High power marks for **document sharing and manipulation** mean that the product supports image annotation and reordering and can link into existing e-mail systems. Also critical for a strong rating in this area are OCR capabilities, indexing, and

flexible keyword document searches. High marks for ease of use go to programs that aid users with searching and distribution.

As with most network products, the maintenance is just as important as what goes on at each user's

workstation. Products that receive an excellent rating on our **setup and administration** task can archive images as well as track their use on the network and provide security and access rights. The quality and depth of documentation and the ease of installation routines becomes important for our ease-of-use rating on this task.

SUITABILITY TO TASK

Product Name	Power		Ease of Use	
	Power	Ease of Use	Power	Ease of Use
Document input and output	EXCELLENT	POOR	EXCELLENT	POOR
Document sharing and manipulation	GOOD	FAIR	GOOD	FAIR
Setup and administration	FAIR	GOOD	FAIR	GOOD

Departmental Image Management

Alacrity Systems Inc.

• E-Quip-Workgroup Imaging

ALL REVIEWS BY LORI GRUNIN
E-Quip-Workgroup Imaging's easy-to-use, well-designed set of office productivity tools really dominates its personality. While this program from Alacrity Systems (\$2,495 for the 10-user version) meets the criteria to be considered a departmental image-management system, it's stronger when used by individuals instead of workgroups.

E-Quip's biggest weakness is its inability to import existing document image files directly; you basically have to start from scratch with this system. The only files the program can manage are images that are either scanned, faxed, or printed into the system (by printing from any application to a special driver). The program has a reasonable set of batch-

scanning functions, and E-Quip stores its files as standard Group 3 multipage TIFFs, to which you can attach a description of up to 127 characters stored in the file header.

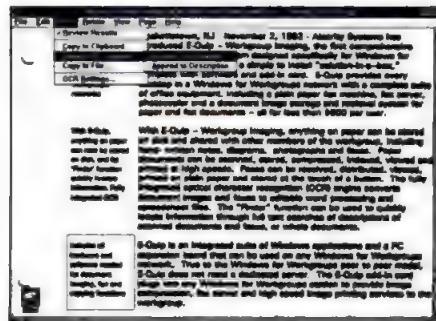
READ ME

You can perform OCR on a document—E-Quip uses the Calera OCR engine—and save the results in a variety of file formats, in the Clipboard, or in the document description field. The files reside anywhere you wish; the program searches through a user-specified path on

up to three phrases in the document description or within a range of modification dates.

While E-Quip's search capabilities are fairly limited,

the rest of the product is better-developed. The product ships with a 16-bit card that serves as a scanner, fax modem, and high-speed printer interface. But you don't have to use the interface for scanning; during testing, we successfully con-



E-Quip lets you perform OCR on a selected area of a document, placing it into a 128-character document-description field.

figured the system to use our HP scanner interface. The product's own scanner interface, however, is limited to a few models.

You install the board into the workstation designated as the Groupserver, and the user of that workstation is responsible for the routing of faxes and other management functions. Because the card takes up two slots (one if you don't use the scanner interface) and because several applications need to be running for the server to function, you

should really designate a lightly-used station as the Groupserver. When faxes come in, the Groupserver user views the first page only, then forwards it to the appropriate recipients. You can also define a time period for Night Delivery fax transmission. With the exception of the ability to password-protect E-Quip's Mailroom access, all security is determined by the network operating system.

FAX IT

Workstation fax capabilities include broadcast faxing and the Stapler utility, which allows you to combine pages from different sources for sending faxes. The Copier utility allows you to scan faxes directly to

SUITABILITY TO TASK	E-Quip-Workgroup Imaging	
	Power	Ease of Use
Document input and output	FAIR	GOOD
Document sharing and manipulation	GOOD	GOOD
Setup and administration	GOOD	GOOD



Evaluating Image-Management Software

We tested how well these departmental image-management solutions could meet the needs of relatively small, well-focused workgroups.

Our test-bed—and the tools we used in it—was designed to reflect a typical department-level or workgroup office situation. For the most part, the products we looked at here stood ready to meet the image-management needs of a workgroup, and therefore handled our tests with aplomb.

To test these departmental image-management solutions, PC Magazine Labs set up a small network as the test-bed, which included one server running NetWare 3.12 and two workstations. To simulate a small workgroup environment, we attached a Practical Peripherals 14.4/V.32 fax modem, one Hewlett-Packard II CX Scanner with ADF, and one Hewlett-Packard HP LaserJet III.

After installing the products on the server and worksta-

tions (as detailed in each product's installation information), we began to create an image database. If the product allowed us to do this, we faxed a multipage document directly into the system, batch-scanned in several documents, and imported existing files that included .DOC, TIFF, WK*, and .XLS formats.

We then attempted to use the native optical character recognition (OCR) capabilities of each product to process entered documents. We then took the text files that resulted from the OCR process and indexed them in their entirety for use on our keyword-retrieval tests. We also tested each product's information-retrieval, annotation, and sharing abilities by annotating, routing, faxing, printing, and retrieving document images.

Although these products are primarily intended for use in small groups or departments, each usually requires some degree of administration. As a result, we looked at file security and archiving as well. This included a number of architectural considerations, such as the compression format applied to each file, the programming tools available to the administrator, and whether or not the system uses a database back end.



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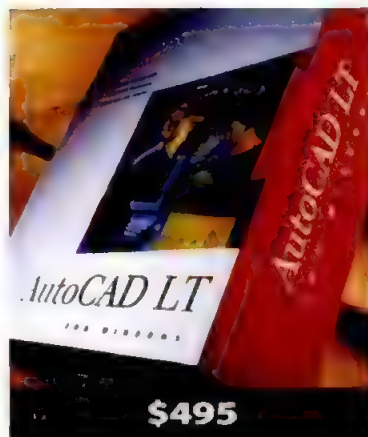
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Large-Scale Image Management

By Pauline Ores

The departmental image-management products we look at in this roundup work well for small, focused groups. When it comes to implementing corporate- or campus-wide image-management solutions, however, the requirements are quite different. For one thing, the software must be inherently scalable, allowing you to start small and later add users across a network. These corporate-wide solutions also need to offer more security, indexing, query, storage, and retrieval options.

As you would expect, such performance doesn't come cheap: Enterprise-wide image-management solutions are commonly priced per server, by the number of users, or both. Final costs, including custom implementation, hardware, training, and technical support, usually start at \$10,000. Although not priced as single-user systems, these solutions range in price from \$600 to \$3,000 per user.

WHAT'S THE DIFFERENCE?

Most enterprise-wide solutions offer advanced password protection that can restrict viewing, printing, exporting, or annotation of certain pages or text files. These solutions can index fields, as well. Transaction logs are not uncommon in these products, either.

Unlike standard document-management software packages, document image-management products save unalterable images of the original files. These images can arrive as scanned documents, faxes, or as graphical file formats such as .PCX or TIFF.

At the time of this writing, only Integra Business Systems' Docubase and the Courtland Group's Ultra PLUS+cold can import files in their native formats; MacroImage from Macrosoft should also feature this capability by the time you read this. At the simplest level, image-management solutions save each image file with its

associated index information. Almost all of the enterprise-wide systems provide a means of securing or reconstituting the image database in the event of corruption.

IMAGE ENABLING

While all of these solutions share many common features, it is possible to group them into three general categories. The simplest of these products—Docubase, Mira Computer Imaging Systems' LOOK Image Management, MacroImage, and Image-Tech Corp.'s PaperGate—fall into a category of products usually referred to as *image-enabling solutions*. These products are best suited for archiving: They are designed to scan, file, retrieve, and fax all of a business's document images, and usually include an associated database. Because documents are only represented as images, these products don't offer optical character recognition (OCR) capabilities except through add-on products, nor do they provide any workflow options. Using these products involves writing each scanned image or incoming fax to an optical drive. All image-enabling products allow manual indexing of files to their related database entries, while some products offer autoindexing capabilities for computer output to laser disk (COLD), as well.

PaperGate provides network capabilities for up to 100 users while offering the ease of use found in shrink-wrapped departmental image-management packages. A production-oriented solution with a user-defined database and data-entry form,

PaperGate is primarily used in large government installations. Though PaperGate doesn't offer OCR capabilities, an optional bundled programmable interface (the Personal REXX for Windows programming language from Quercus Systems) allows users to write macros and command files to control OCR, autoindexing, and database

applications. Other features include text annotation, version control, and image caching in RAM.

LOOK Image Management also focuses on ease of use by featuring context-sensitive help, toolbars, and 16-hour-a-day technical support. It also features transactional logging and index

recovery from optical media.

A modular approach is another means of providing ease of use in addition to scalability. Macrosoft's document image-management system for Microsoft Windows, MacroImage, is one of a number of available modules that make up the Macrosoft SmartFile System. By interfacing with other modules, MacroImage can archive text and voice data as well as archiving documents. MacroImage also supports COLD through Macrosoft's own MacroFiche search-and-retrieval server software.

Similarly, the Docubase optical disk system offers integrated COLD support through its Docubase O/S Optical Server, which handles all transaction processing as well as file input and output. Docubase accepts popular word processing and spreadsheet files in addition to individual video frames. The Docubase Windows Tool Kit interface provides DDE support.

Unlike standard document-management software packages, document image-management products save unalterable images of the original files.

Departmental Image Management

IMAGE & TEXT MANAGEMENT

Slightly more versatile products, such as Ultra PLUS+cold from Courtland, combine imaging with text-management capabilities. This allows documents to be scanned, translated to text via OCR, and then indexed and searched using full-text-retrieval methods. While the system can support an unlimited number of users, the average installation is from 10 to 20 users.

Designed for archiving documents, Ultra PLUS+cold offers sectional OCR for scanning forms, and places the associated ASCII data into its index field. Users can also use a form overlay of their own design, allowing them view and print information that matches existing printed forms, and add notes with comments.

Networked installations of Ultra PLUS+cold will require Courtland's Intelligent Image Caching Software (IICS) module, which functions as a server for image caching, faxing, printing, and prioritizing user requests to speed performance. IICS also controls optical drive jukebox robotics while accessing the drive through a SCSI bus disconnect routine. This is something that many vendors leave to the jukebox vendors.

THE NEXT LEVEL

The most sophisticated *image-integration* solutions, such as Techknowlogy Imaging Software for Windows, make image-management an integral part of a company's process by adding workflow capabilities. Techknowlogy Aquisition offers this product for \$4,995 for the server and \$195 per user.

Typical workflow options, such as automated-document or event-driven routing, document location, and status reporting, offer a means of directing documents from one department to another with specific action requests. Order fulfillment is an example of an application that benefits from this approach. □

the printer, as well as to scale and collate pages.

All in all, E-Quip worked well during our tests. Installation went relatively smoothly: E-Quip runs on any NetBIOS-compatible network, and the software autoconfigures to match the board's address setting. The software proved easy to use, although the multitude of modules and dialog boxes give the product a somewhat disjointed feel.

While the fax server design integrates well into a workgroup setting, the image-management aspect of the system—with its scattered file-management approach—is really more suited to individual use rather than to workgroup use.

► **E-Quip-Workgroup Imaging.** List price: 10-user package, \$2,495. Requires: 386-based PC or better, 4MB RAM, 10MB hard disk space, DOS 5.0 or later, Microsoft Windows 3.1. Alacrity Systems Inc., 43 Newburg Rd., Hackensack, NJ 07840; 908-813-2400; fax, 908-813-2490.

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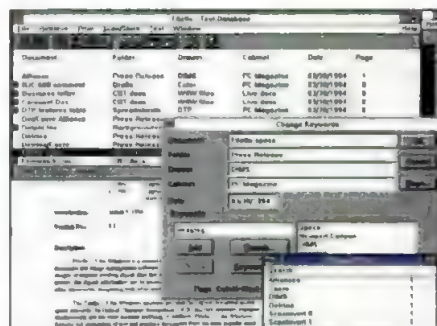
Newport Canyon Associates

Fileflo 3.5 for Windows

One of the lesser-known products in this roundup, Newport Canyon Associates' Fileflo 3.5 for Windows (\$2,595 for a five-user version) is a solid product that provides a few capabilities not found in other departmental image-management programs. However, it also has a few weaknesses, particularly in importing scanned documents, that detract from its competitive edge.

While Fileflo uses the same filing cabinet metaphor found in the other programs we tested, it takes a more database-like approach to document listings. All documents appear in a single list rather than in a hierarchy, but you can sort them on the different index fields. Based on the Raima database engine, Fileflo offers partial and exact index-based searches across up to eight user-definable fields. Fileflo can also import and launch text documents as well as images.

Unlike other keyword-only programs,



Fileflo lets you attach keywords to individual pages within a document.

however, Fileflo allows you to attach keywords to individual pages of a document image. Fileflo displays keyword pick lists for all searches, and you can assign searches according to index fields such as dates or folders.

For every five-user license, one user has the right to install Calera's OCR engine, but Fileflo can access an existing copy of WordScan 2.0 on a workstation. Overall, Fileflo's OCR implementation works well. You can create templates that let the program recognize text in selected index fields or the note field, or recognize a file linked to the image or to a separate document. Fileflo allows only one note per page, however, which cannot be attached to a specific area of the page.

The biggest problem we ran into with Fileflo was batch-scanning our test files into the system. In the Continuous View mode, which displays the image while it is being scanned, the resulting image was useless. Also, text documents must be imported one at a time, and there's no

support for native file formats or for receiving faxes. All document images, however, can be batch-scanned, indexed, and stored. Fileflo also includes

built-in support for optical drives and jukeboxes.

Installing the system is somewhat difficult, mostly because of Fileflo's poorly arranged, scattered documentation. Also, installing a scanner involves manually editing your system's CONFIG.SYS and AUTOEXEC.BAT (the company is currently working to enhance the installation

	SUITABILITY TO TASK	
	Fileflo Power	Ease of Use
Document input and output	GOOD	GOOD
Document sharing and manipulation	GOOD	GOOD
Setup and administration	GOOD	GOOD

Departmental Image Management

routine and documentation). Fileflo ships with a variety of versions of the Raima Lock Manager, which manages the database record locking. We tested using the Windows version of the Lock Manager and experienced no problems. One drawback, however, is Fileflo's lack of security features, although Version 3.51, which should be out by the time you read this, will allow the system administrator to assign up to ten different levels of security for each user, with the capability of disabling up to 64 menu items at every security level.

With no drag-and-drop capabilities or support for OLE and DDE, Fileflo's interface isn't exactly state-of-the-art, but it does the job. Users in moderate-size workgroups with lots of files and no security restrictions will probably find Fileflo up to their image-management tasks.

► **Fileflo 3.5 for Windows.** List price: *five-user package, \$2,595; five-pack extension, \$1,295.* Requires: *386-based PC or better, 4MB RAM, 80MB hard disk space, DOS 3.3 or later, Microsoft Windows 3.1.* Newport Canyon Associates, 2082 Business Center Dr., #150, Irvine, CA 92715; 714-833-0333; fax, 714-833-2350.

Circle 490 on reader service card

Westbrook Technologies Inc.

• File Magic Plus for Workgroups

It's neither the most elegantly designed product in this roundup nor the easiest to use, but Westbrook Technologies' File Magic Plus for Workgroups, Version 3.8, (\$3,495 for ten users) offers the most pow-

Built around the Zyindex indexing engine, File Magic Plus supports extremely sophisticated keyword and full-text search options, including Boolean and proximity operators, wildcards, and variables. Searches may be named and saved as well. You can also search across groups using different criteria and create user-definable fields.

File Magic Plus's collection of security tools allows the administrator to set individual user rights for global privileges such as reading, writing, and deleting. One drawback for large installations is that users must be set up manually; the product can't read the bindery. Individual workstations may also be set up as scan and fax import servers.

FILE FLEX

File Magic Plus shows similar flexibility for getting documents into the system, with batch importing of live documents and images (it supports drag and drop from the File Manager), scanning and indexing, and similar support for importing faxes as found in most of its competitors. File Magic Plus uses a combination of Group 4 and JPEG compression schemes on images. Documents can be sent to a globally accessible public In-Basket or to individual users for processing at any point in the acquisition process.

While you can perform optical character recognition on image-based documents and save the recognized text as a native application file, the program also performs recognition for the purpose of full-text indexing. Any document in the system can be full-text indexed.

In a slightly awkward move, File Magic Plus stores both templates and user-defined fields as links to the Document Group. Furthermore, when File Magic Plus retrieves records that meet specified search criteria, it displays them in a clumsy, inefficient format of cascading notecards. File Magic Plus also gives you image and WYSIWYG text views, as well

as the ability to customize the setup for launching and loading documents in their native formats.

Currently, File Magic Plus is limited to a single database path per network—a drawback that will be rectified in the next

release, due later this year—although it currently supports removable media. Database records may be exported and merged into other databases.

Keep in mind that the Zyindex engine that gives File Magic Plus its great searching flexibility also limits the product's portability

because the engine doesn't support SQL or other standard retrieval mechanisms. Nevertheless, as an all-around solution for medium-size workgroups who need maximum search flexibility and scalability, File Magic Plus for Workgroups offers the best solution of the products we review here.

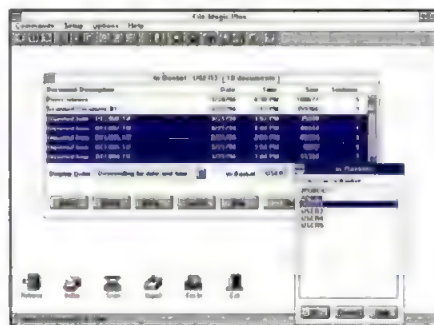
► **File Magic Plus for Workgroups, Version 3.8.** List price: *ten-user version, \$3,495.* Requires: *386-based PC or better, 8MB RAM, Windows-supported monitor and printer, Microsoft Windows 3.1.* Westbrook Technologies Inc., 22 Pequot Park Road, P.O. Box 910, Westbrook, CT 06498-0910; 800-949-3453; 203-399-7111; fax, 203-399-7137.

Circle 491 on reader service card

ImageFast Software Systems Inc.

• ImageFast

Like the other products in this story, ImageFast Software Systems' workgroup product manages document images using a filing cabinet metaphor—it also offers keyword and full-text indexing and rudimentary workflow capabilities. But while other products rely on proprietary or third-party viewers for displaying retrieved documents (with application launching intended as a supplementary rather than a central tool), ImageFast, Version 2.0, (\$3,495 for two users, \$749 for each additional user) instead depends almost entirely on launching native appli-



File Magic Plus uses a simple system for routing scanned documents and imported images to users around the network.

SUITABILITY TO TASK

File Magic Plus

Power

Ease of Use

Document input and output	EXCELLENT	EXCELLENT
Document sharing and manipulation	EXCELLENT	GOOD
Setup and administration	EXCELLENT	GOOD

erful set of tools available for medium-size to large workgroups. File Magic Plus comes equipped with all the functions essential for managing both text- and image-based documents, integrated into a hierarchical structure of file cabinets and drawers, which Westbrook calls Super-Groups and Document Groups.

-One-Stop Shopping: *Bundled Hardware and Software*

By Lori Grunin

Workgroups taking the departmental image-management plunge for the first time generally lack at least one piece of the puzzle, be it a magneto-optical drive for image archiving, a scanner for getting those files into the PC, or a PC-based fax for sending and receiving digitized documents. Three vendors—Alacritty Systems, Pinnacle Micro, and Visioneer—offer departmental image-management solutions bundled with peripherals, though these products target slightly different users by taking varied approaches to workgroup integration.

PAPERLESS 1

Thanks to the bundled 650MB optical drive and 30-page, sheet-fed, gray-scale scanner, the \$6,995 Paperless 1 system from Pinnacle Micro (Irvine, California; 800-553-7070, 714-727-3300; fax, 714-727-1913) occupies the pricey end of the spectrum. Designed for relatively small workgroups or single-user installations with a single scan-and-store station, documents may also be printed to an image file from the originating application, such as a word processor or spreadsheet. However, all documents must reside on a central optical disk player in "file cabinets."

As with many of the systems we look at in this story, Paperless 1 controls access via a user database. Its security is limited to passwords and random file naming. The program also includes Paperless Mail, a simple built-in tool for distributing document images over the network.

Paperless 1 allows basic keyword-based document image retrieval. Keyword entry occurs via administrator-designed templates. While the

templates are fairly simple, the program does allow you to set field types and attributes.

E-QUIP OFFICE-IN-A-BOX

At \$499, Alacritty Systems' E-Quip Office-in-a-Box (Hackettstown, New Jersey; 908-813-2400; fax, 908-813-2490) is a giant step down the ladder of turnkey solutions in both price and performance. Aimed at the small- and home-office market, Office-in-a-Box offers one thing neither of the other bundles do: scalability. You can always integrate the standalone product into the workgroup system reviewed elsewhere in this story.

By themselves, the product's peripherals are nothing to write home about, which includes an OEM single-page, sheet-fed scanner (you can also get the \$849 E-Quip Office-in-a-Box ADF, which has a 30-page feeder, as well as a \$189 software-only version). But the software, which includes full-featured fax send and receive, OCR, a document storage-and-retrieval engine, and a photocopy utility for scan-to-print functionality, integrates with the hardware to form the electronic equivalent of an administrative assistant.

Office-in-a-Box documents are stored in standard Group III format, with keywords embedded in the headers. You search across user-specified paths for keyword, modification date, or document descriptions. Office-in-a-Box ADF also supports the batch scanning of documents.

PAPERMAX

Of the three, Visioneer's \$499 PaperMax system (Palo Alto, California; 800-787-7007, 415-493-9599; fax, 415-855-9750) offers the

most technologically interesting—although not necessarily the best—of the solutions. The system is based around a slim, single-sheet scanner that plugs into the PC's serial port. Feeding a sheet into the scanner automatically activates the unit and launches the PaperMax's MaxMate application. You can also import image files.

MaxMate lets you collate the individual scanned pages into "stacks," which appear on the desktop, and saves the stacks using a proprietary compressed file format. You can then annotate the pages with text or highlight selected passages. For OCR, or to fax, print, or e-mail pages, you simply drag them to the automatically installed icons for third-party applications such as OmniPage or WinFax.

MaxMate's cross-application integration works well. For example, when importing a fax from WinFax, MaxMate pulls up some of the information from your fax logs rather than just presenting you with meaningless filenames. One of the product's unique strengths is the inclusion of distributable DOS, Macintosh, and Windows viewers. The cross-application links, combined with the ability to run locally or off the server, represent PaperMax's workgroup tools.

Unfortunately, the product has a couple of serious weaknesses. First, the serial-based scanner, while inexpensive, may prove a pain for users with two occupied serial ports (although the unit will recognize COM3 and COM4). More importantly, the program has limited search capabilities: It searches only across annotations and by modification date. The viewers do not allow searching whatsoever. □

Departmental Image Management

cations to view and edit files.

When you import a file into an ImageFast folder, via the menus or by dragging them in from the Windows File Manager, the program simply copies the file into a directory linked to the folder and renames it. Documents are listed by filename plus a five-digit number appended to the end. Double-click-

ing the entry launches the native application for that file. ImageFast ships only with a TIFF viewer, sufficient for handling scanned-in images that have no associated application. ImageFast can also directly manage faxes in conjunction with any CAS-compliant fax modem.

This architecture lets ImageFast handle any file type. And unlike most of the other products, which rely on Mastersoft filters and viewers, you're never a version behind in your file viewer. However, it also means that ImageFast can't compress the files (except to Group 4 TIFF), and the package requires the use of a fairly homogeneous set of applications across the workgroup. Plus, security is limited to password protection at the database level.

ImageFast offers some of the best features for end users to speed the keywording process, such as the ability to carry

keyword engine is based on the Raima database and the full-text engine is based on Compusearch technology. Unfortunately, these are not seamlessly integrated into the product. For instance, only doc-

ument images on which you've performed OCR may be full-text indexed. You're also restricted to one or the other type of search for any given query,

although the product does support fuzzy and wildcard searches.

ImageFast's integrated workflow product, WorkFast, also sets the package apart from the rest of the other products we review (for comparison with other workflow products, see the sidebar "Workflow Automation Software: Go with the Flow?"). The administrator sets up a list of status choices, such as *pending*, *rejected*, and *approved*, with which you can construct flows that designate default document routings. For pending jobs, you can change the document status, return it to the sender, or forward it to the next recipient. You can't, however, deal with each attachment individually; they all move as a group in the workflow.

IMAGEFASTER

The next version of ImageFast, due to ship by the time you read this, will offer a variety of improvements, including better batch scanning, integration between the keyword and full-text query interfaces, and hooks into MAPI, MHS, and VIM e-mail systems.

If ImageFast's combination of image management and workflow strikes the right chord for your needs, and all the members of your workgroup employ the same set of applications, then you'll probably find that this program provides an attractive, easy-to-use alternative to the other products in this story.

► **ImageFast, Version 2.0.** List price: two-user version, \$3,495; additional users, \$749 each. Requires: 386-based PC or better, 4MB RAM, DOS 5.0, Microsoft Windows 3.1, NetBIOS. ImageFast Software Systems Inc., 7926 Jones Branch Drive, McLean, VA 22102; 800-899-6665, 703-893-1934; fax, 703-893-7499.

Circle 492 on reader service card

Caere Corp.

• PageKeeper

Although its rough edges could stand a little smoothing, Caere Corp.'s \$595 PageKeeper, Version 1.1, gives small to medium-size workgroups a unique set of tools for organizing and retrieving the information in image- and text-based documents. PageKeeper combines the indexed-database approach found in products such as Fileflo and File Magic Plus (PageKeeper uses a proprietary scheme based on Caere metafiles plus associated pointers) with the decentralized, data-can-live-anywhere approach taken by products such as E-Quip-Workgroup Imaging and the Watermark Discovery Edition.

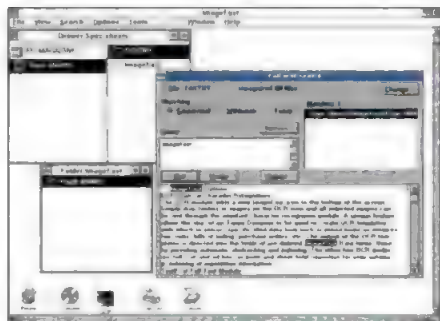
In a nutshell, you create a PageKeeper database, then scan in pages or import

SUITABILITY TO TASK

	PageKeeper	
	Power	Ease of Use
Document input and output	GOOD	GOOD
Document sharing and manipulation	GOOD	EXCELLENT
Setup and administration	FAIR	GOOD

images in .PCX or TIFF format, as well as a number of word-processor document and spreadsheet formats. You have the option of scanning, editing, and indexing in batch mode. Because all batch jobs go into a central queue, you can configure PageKeeper for distributed processing—say, scanning on one machine, OCR on a second machine, and indexing on a third, although for OCR and indexing someone must be present to force a poll of the queue. In a missed opportunity, Caere opted not to support fax reception (although you can send faxes), nor does PageKeeper support native fax file formats.

Unlike the other products in this roundup, PageKeeper doesn't rely on typical keyword-based indexing. Instead, it automatically performs OCR on all imported or scanned document images and supplants the manual keywording scheme with a more automatic approach. PageKeeper implements natural language-processing algorithms to find topical words, then uses the three most frequently occurring of these as the keywords that identify a document in the program's hierarchically structured folder view. In addition, the program



ImageFast uses separate databases for keyword and full-text indexing, but it supports fuzzy and wildcard searches.

over data from the previous database record. But unlike the other products in this story, the program doesn't ship with any predefined forms for entering keywords, which means it will take longer to get up and running.

The program keeps two separate indexes for keyword and full-text searches. The



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Take up the reins of your brain.

The Document Masters: PC DOCS, Saros, and SoftSolutions

By Steven C.M. Chen

We live in the recycling age. We recycle plastic, glass, and especially paper. In the changing office, we also recycle ideas. But to do so, we must have access to the information and ideas we've used before. Document-management systems can do that for us. By managing hundreds of thousands of documents and maintaining most of them in their original forms, document-management systems allow us to find, access, combine, and even reuse the best elements of existing documents to make new ones today.

The last time we looked at document-management software ("Document Management: The Painful Transition," June 29, 1993), Saros Corp.'s Mezzanine, Version 3.0a, including the ViewZ front end; PC DOCS, Version 4.1; and SoftSolutions for DOS and Windows were among the products we reviewed. Each product has evolved since then. All have added more features, including improved functionality, more administrator-friendly installation procedures, and application integration. Support for e-mail is also standard. And Saros has even taken its core product and folded it into a brand new one called Saros Document Manager, Version 1.01.

Additionally, PC DOCS Mobile (in essence a portable version of PC DOCS Open) allows users to take indexed documents on the road and then reconcile any changes with the master database when they get back to the office. SQL (structured query language) is now standard with PC DOCS Open, Version 2.0; and both Saros Document Manager and SoftSolutions for Windows, Version

4.0, offer improved user interfaces.

However, there are still plenty of shortcomings. A document-management system administrator will still face the daunting task of designing the system. You will be better off not using such a system than implementing a badly planned one. Moreover, there are always resource considerations, training, and user resistance to overcome.

Down the road we should see even more players join the action. Documentum, from the company of that same name, for example, will migrate from the Unix world with the introduction of a Windows NT-based server.

PC DOCS OPEN, VERSION 2.0

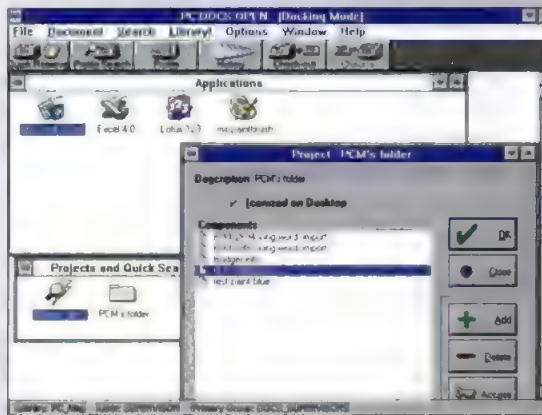
The best has simply gotten better. Version 2.0 of PC DOCS Open is still

portable version, PC DOCS Mobile.

Since the last time we reviewed the DOS-based PC DOCS, it has gone through a complete metamorphosis. It is now available for Microsoft Windows as PC DOCS Open (the DOS version, PC DOCS, is still available). More importantly, the Windows version no longer relies on Btrieve. Instead, it is now a full client/server application. It will work with the most popular SQL database engines, including those from Oracle and Sybase. One drawback of this approach is that users with a large installed base will need to dedicate a file server to run the NetWare Loadable Module (NLM). DOS and Macintosh versions of PC DOCS Open should be available soon.

PC DOCS Open supports a broad spectrum of Microsoft Windows applications—as long as they support Windows DLLs (dynamic link libraries) in their macro languages. PC DOCS Open's desktop maintains the ease of use of the DOS product. It has icons across the top for some of the most-used functions, such as search, profile and check-in and -out. Oft-used search routines can be saved as icons for easy retrieval. PC DOCS Open also lets you place related files in folders. The latter feature is especially important for keeping project-related work files together.

For a large enterprise, you can set up multiple libraries organized by either department or location. The import functions in PC DOCS Open also allow you to import data from older PC DOCS documents and other document-management systems. Also included is version tracking for up to 99 versions and 26 subversions, which includes a com-



PC DOCS Open, Version 2.0, allows users to save regular search routines as icons for easy retrieval and place related files into a folder.

the only document-management system that supports more than one type of SQL database engine. PC DOCS Open is priced at \$299 per PC and \$495 per server. When bundled with Sybase or Oracle, it's \$395 per PC and \$695 per server. Add \$50 per user for the

ments field to describe a given document version and the ability to restrict the editing of previous versions of a document. PC DOCS Open maintains an audit trail, as well.

There's still room for improvement in PC DOCS Open. Setting up the SQL, especially for the first time, can be cumbersome, and the manual is only average in documenting SQL installation.

SAROS DOCUMENT MANAGER

Mezzanine, now at the core of Saros's new Saros Document Manager, has the honor of being the first document-management engine to use Microsoft's SQL Server. Saros Document Manager, Version 1.01, is a powerful document-management system with just about every feature you could want. It is designed for a large number of users, typically 500 or more, and costs \$495 per user.

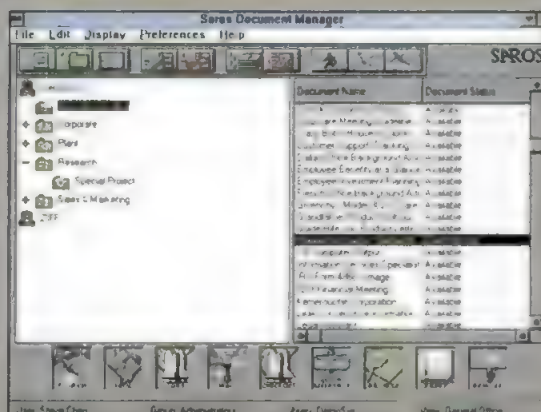
Because it doesn't limit the number of servers you can install, Saros Document Manager gives you greater flexibility in designing an enterprise-wide solution. Novell NLM- and Windows NT-based versions are expected to be released in the near future.

To simplify the document-management system design process, Saros Document Manager includes a demo library system that's ready to run. You can use it as training material or as a reference, and you can reinstall it as many times as necessary.

Saros Document Manager gives you speedy access to the most commonly used functions via two icon bars. Take the bottom icon bar (or Drop Zone), for example: If you need to find information on a file, you just drag the file and drop it into the Info icon. You can do the same with search, copy, checkout, print, and a few other functions.

The container windows in Saros Document Manager are also new. These user-definable tree-like structures resemble the branching metaphor found in the Windows File

Manager. This gives users the flexibility to create a document structure that is similar to the way an enterprise is organized. Saros Document Manager can also store oft-used search routines in special folders called "Smart Containers."



Saros Document Manager's Drop Zone icon bar provides quick access to the most commonly used functions, including search, copy, and print.

Saros Document Manager is also notable for the distributed nature of its server. If you have multiple servers installed and one of them is busy, Saros Document Manager will offload the requests to a different server and speed up the response time. The last time we reviewed Mezzanine, its ViewZ front end did not support full-text searches. Now, with Saros Document Manager, you can take full advantage of the Mezzanine engine's ability to perform a quick or power search. In power search, you can search both profile and full text.

The product also includes strong version-control facilities that track when a document has been "checked out" of the system so that other users cannot access and modify the document at the same time. When the user returns the document to the system, Saros Document Manager automatically saves it as a new version. As a result, an audit trail is always available.

Saros Document Manager is a solid, full-featured document-management solution; although it can be a challenge

to find the features and figure out how to use them.

SOFTSOLUTIONS FOR DOS AND WINDOWS

SoftSolutions, Version 4.0, remains a reasonably priced document-management solution: The standard Windows and DOS versions cost \$495 per server and \$295 per user. To reduce network traffic and speed up file access, you can add the \$1,995 Server Enhancement Module (SEM) to your Novell file server. The SEM will also manage access to multiple document databases so users won't have to log in to each file server.

SoftSolutions has added dozens of enhancements since our last document-management software roundup. For example, the Activity Log will track all the past activity on a document, and the viewer now supports about 100 formats instead of only a handful.

Also, OLE 2.0 (SoftSolutions can act as an OLE server only) and open database connectivity (ODBC) are now standard in the Windows version.

SoftSolutions' Windows user interface still has a few rough edges. However, a new interface, the Document Desktop, is available for \$79 per user and \$250 per server. This new option provides a much more intuitive interface with which you can view icons for documents and create folders for better organization of document files.

Installation of the DOS version is just as time-consuming as before. The Windows installation has improved, however, and if necessary, you can now uninstall SoftSolutions. The integration with Windows applications, however, is still limited to products that support OLE 2.0.

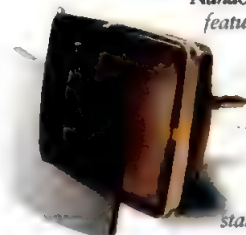
For a small to midsize business, SoftSolutions is a good document-management system, especially if you have a mix of DOS and Windows users. Plus, its modular approach allows you to add additional features as you need them. □

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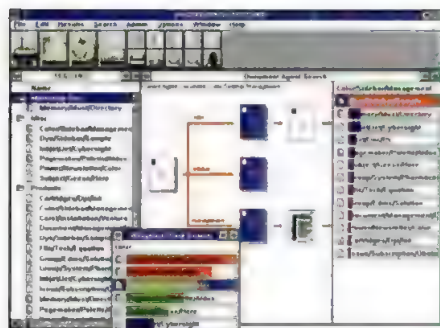
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F Series	17"	0.28mm	75-85kHz	1440x1024
T Series	19"	0.28mm	75-85kHz	1600x1200
F Series	19"	0.28mm	75-85kHz	1600x1200
T Series	21"	0.28mm	75-85kHz	1792x1344
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PageKeeper uses advanced techniques to narrow down the results of full-text searches.

executes weighted word searches and Boolean operations to report the results ranked according to the determined relevancy of the document.

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PageKeeper lacks some tools that would make it a robust, upwardly scalable workgroup product. It doesn't easily support indexing files located on removable media, there's no overwrite warning when editing document text, and it lacks even the most minimal security—anyone can log in as administrator (a drawback Caere plans to fix in the next version). In addition, the overhead of PageKeeper's indexing scheme will potentially bog down performance as documents get larger.

On the other hand, Caere's products in the single-user arena (Fax and Find and PageKeeper Personal) make it easy to scale upward from an individual setting to a small or distributed workgroup environment. If your needs include intelligent search-and-retrieval and simple administration, then PageKeeper should suit you fine.

► **PageKeeper, Version 1.1.** List price: \$595. Requires: 386/33-based PC or better, 4MB RAM, 10MB hard disk space, Microsoft Windows 3.1. Caere Corp., 100 Cooper Court, Los Gatos, CA 95030; 408-395-7000, 800-535-7226; fax 408-354-2743.

Circle 493 on reader service card

Watermark Software Inc.

● Watermark Discovery Edition

By Watermark Software's own admission, the \$149 Watermark Discovery Edition, Version 1.04, falls short as a full-function system for managing paper. The product is actually intended to allow interested buyers to experiment with departmental image-management software before they scale up to the company's Watermark Professional Edition (\$295 per user), which is scheduled to ship by the time you read this. Weak knees and all, the Discovery Edition includes a few notable capabilities and offers an important glimpse into the architecture of its more full-featured sibling.

The Discovery Edition brings in PC-based faxes, disk-based bitmaps, or directly scanned-in images; lets you assign keywords to them; and turns them into Image Objects, which are individual files compressed into standard Group 4 format with the keywords and other document properties stored in the file headers. Rather than include a built-in distribution mechanism or plug into a network-based e-mail system, the Discovery Edition employs OLE 1.0 as its method for sharing documents. You have a choice of a traditional OLE link—embedding a low-

SUITABILITY TO TASK

Watermark Discovery Edition

	Power	Ease of Use
Document input and output	FAIR	GOOD
Document sharing and manipulation	FAIR	GOOD
Setup and administration	FAIR	GOOD

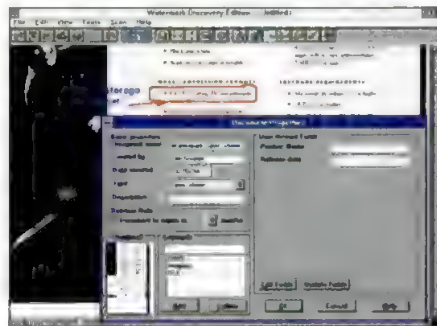
resolution bitmap that points to the original Image Object—or embedding the entire Image Object within the client document.

You retrieve documents in the Discovery Edition by searching across drive paths with user-specified keywords and other fixed fields, such as creation date and document name. In addition to the predefined keyword fields, you can specify user-defined fields as well.

In some ways, the Discovery Edition offers very good integration with its fellow applications. For example, it can not only import WinFax PRO 3.0 files, but it

can bring up the data from that program's Send and Receive Logs, as well as thumbnails of the faxes. You can also drag and drop document pages to rearrange them, as well as annotate them with text, a freehand drawing, or a simulated highlighter.

Ultimately, the Discovery Edition proves itself more a single-user than a multiuser product. Because there are no keyword pick lists, searches will become unwieldy with an increasing number of



Watermark Discovery Edition allows you to specify user-defined fields and search across drive paths with user-specified keywords.

users. Similarly, the performance of the path-searching architecture collapses under the weight of its burden as the number of files increases. Also, when retrieving from user-defined keyword fields, you must enter the field names as well as the keywords from memory. Both networked and individual users may also become frustrated with the program's lack of batch-processing capabilities for importing files into the system and its one-document-open-at-time limitation. You can, however, run multiple instances of the program.

The Professional Edition addresses many of the weaknesses in the Discovery Edition, including the addition of a SQL-based image server, batch scanning, mail enabling, and integration with Lotus Notes. But the Watermark Discovery Edition, Version 1.04, will just leave you wanting more. □

► **Watermark Discovery Edition, Version 1.04.** List price: \$149 per user. Requires: 386-based PC or better, 4MB RAM, 2MB hard disk space, DOS 5.0, Microsoft Windows 3.1. Watermark Software Inc., 129 Middlesex Tpk., Burlington, MA 01803; 617-229-2600; fax, 617-229-2989.

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First Looks

INTERNET ACCESS TOOLS

Stairway to Data Heaven: Accessing the Internet

PC Magazine's Network Edition examines six ways to navigate the on-line maze.

By Steven J. Vaughan-Nichols

What is the Internet? To some, it's a way of retrieving newsfeeds. To others, it's a way of locating crucial information. Still other users see the Internet as the way to collaborate on projects and share documents.

In truth, the Internet is all and none of these. The key to your perception of it lies in which Internet features you use: mail, newsgroups, or finding and transferring files with the File Transfer Protocol (FTP).

How effectively you use those features to navigate the on-line maze begins with

your choice of access tools. And the choice of access tools begins with discerning how much you can spend and how much bandwidth you need. For those hearty souls who need lots of bandwidth and can spend the money, there are high-speed remote connections such as Switched 56 (56 Kbps) or T1 (1.544 Mbps) that cost from roughly \$500 to \$3,000 per month, depending on the type of link. But if you're like most users and do not have or cannot afford a high-speed remote connection, there are still solutions for you. We looked at six, in fact, though many more are and will become available.

Having committed to acquiring a remote connection, you'll want to think about the type of functionality you need.



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Though there are lots of ways to categorize Internet applications, broadly speaking there are three classes of solutions: those that provide only e-mail and newsgroups (threads of related messages), those that provide only file/information location and retrieval services, and those that provide both.

We reviewed six solutions that span these three categories. Of the six solutions we reviewed, the new version of Computer Witchcraft's Winnet for Mail and News, Version 2.1, was the only product dedicated to newsgroups—or Usenet services, as they are also called—and mail facilities. A new Windows version of the National Center for Supercomputing Applications' Mosaic was the only solution we reviewed that is *dedicated* to finding and moving information on the Internet.

The remaining four solutions—Delphi Internet Services' Delphi on-line service, America Online's (AOL) newly added Internet service, BIX, and a new version of The Pipeline's Pipeline for Windows V1R3.5—all give you different degrees of access to e-mail, newsgroups, and file/information location and retrieval facilities.

FRONT ENDS OR SERVICES

Superficially at least, these solutions consist of two components: a front end and a service. The front ends generate the queries, commands, and data that are passed through a Point of Presence (POP)—a service for accessing the Internet.

However, whether each solution is known as a front end or a service depends on market positioning. Three that we review—Delphi, AOL, and BIX—are sold as services, though AOL and BIX also offer front-end applications for the PC—AOL and InterNav, Version 2.0, respectively. Delphi does not offer an application: Your PC becomes a terminal to the Delphi network. Delphi has announced plans to adopt InterNav as a front end.

We selected AOL,



• Pipeline for Windows V1R3.5

Each of the six Internet access tools we reviewed has unique strengths and weaknesses. If you're shopping for a window to the Internet, keep in mind that all of these are works in progress.

Pipeline for Windows is clearly the best of the first

generation. Installation is easy because it doesn't require TCP/IP. Pipeline is the only solution that allows you to perform several Internet tasks concurrently. It also makes searching for and retrieving information as accessible as e-mail and newsgroups.

While none of the other solutions provide as much depth, they do offer some benefits. America Online is a good tool for exploring and provides strong Usenet newsgroups accessibility, but its e-mail capabilities are lacking.

BIX's (and soon to be Delphi's) InterNav is a crude but powerful tool. Users familiar with the Internet may find that it offers users a powerful

command line and its GUI provides ease of use.

Winnet is slick and easy to use. If we had been only looking at Usenet access and e-mail, Winnet would have been our choice.

Delphi's character-based menus may not attract Windows users, but it's the only interface that can be used on any platform and OS that supports a communications program.

Mosaic lures you into the Internet with its World-Wide Web hypertext links to multimedia resources. Its power is both a strength and a weakness. Mosaic is difficult to maintain and totally unsuited for the casual user.

BIX, and Delphi because they are national on-line services that supply Internet access. AOL just added Internet services. Delphi and BIX are long-standing.

The three innovative front ends we reviewed use regional services or POPs like Express Access, Netcom Online Communication Services, and The World. They are Winnet for Mail and News, Version 2.1, Pipeline for Windows V1R3.5; and a Windows front end—

Mosaic. Mosaic and Winnet for Mail and News can run with any POP, but Winnet most typically runs with the company's own POP. Pipeline uses a proprietary protocol: pink slip. Currently, it requires its own POP, but the company is trying to sell its protocol to other POPs.

Application or service, ease of installation is vital. Many people don't want to bother with loading a TCP/IP stack on their machine. Complex installation rou-

tines, IP addressing, and dealing with other technical details can scare many a user. Going through a POP, as all of these solutions require, makes installation much easier since the TCP/IP stack isn't on your machine.

Mosaic is the only exception. It requires a local TCP/IP stack and either the Serial Line Internet Protocol (SLIP) or the Point-to-Point Protocol (PPP) (two protocols for

Information at Your Fingertips

If you're looking for information about	You can find it here:	Using
NetWare help	http://www.novell.com/	Web browser(Mosaic)
UnixWare help	http://www.novell.com/servsupp/unixware/index.html	Web browser(Mosaic)
Microsoft Windows NT	comp.os.ms-windows.nt.setup	newsreader
X.400 mail standards	comp.protocols.iso.x400	newsreader
SNMP	sun.soe.clarkson.edu/pub/ka9q/	FTP
Ethernet	comp.dcom.lans.ethernet	newsreader
Unix standards	ftp.uu.net/usenet/comp.std.unix	FTP
Microsoft SQL server	ftp.microsoft.com/advsys/sqlsrvr	FTP
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Suitability to Task: Internet Access Tools

When it comes to Internet front-end access, there is one paramount concern: ease of use. Anyone can learn to use the Internet if they've the time and desire to learn arcane commands.

News retrieval One of the Internet's most popular features is the Usenet newsgroups. Good newsreaders enable users to discard messages and message threads easily via rules or a kill file that eliminates messages by subject line or author's name. A good news-retrieval program uses a single interface to make it easy for you to reply directly to a message either publicly or privately, to store specific messages and threads, and to enter new messages.

E-mail is the lifeblood of the Internet. A top-notch e-mail interface makes writing a message as easy as working with a high-quality word processor. This means it offers spell checking, a full-screen editor, and block cutting and pasting. At the least, it should offer the features and functions found in Microsoft Windows' Notepad. The best interfaces also support carbon-copy, blind carbon-copy, mailing lists, address aliasing, address books, message-filtering, and binary attachments.

sending IP packets over the Internet). With an IP stack, Mosaic can connect directly to the Internet, which is good for performance because at 14.4 Kbps, Mosaic was really slow. However, the IP can also complicate installation.

Price is one other important issue. All of the front ends are essentially for free with a caveat: There is generally a charge for the time you spend on-line. To obtain a front end, you'll probably need to download it from an on-line service. Mosaic and its required software, Pipeline for Windows, and Winnet are available on ZiffNet in PC Magazine Library Network Edition. InterNav is available on BIX as BIXNAV20.ZIP in the BIXNAV Listing Area. AOL is the only exception. While it's frequently available for free by mail order, AOL is also sold in retail stores.

QUALITY IS KEY

So you've selected the category of product you need. You've decided whether you want to run TCP/IP, and pricing—ever an issue—is something that you've consid-

SUITABILITY TO TASK	
News retrieval	POOR
E-mail	FAIR
Information/ File retrieval	GOOD
Installation/ Ease of use	EXCELLENT

vital. The best interfaces make using search tools likearchie, Gopher, veronica, WAIS, and the Web as easy as possible. They should present information resources with a common user interface and integrate smoothly with other Internet and DOS and Windows programs. Users should be able to copy information to the clipboard or a similar place and retrieve files in a single step.

Installation/Ease of use If an interface requires you to edit TCP/IP configuration files manually, it's not a great interface. The best interface is as easy to install as any first-rate MS-DOS or Windows application: You only have to click on Install to load the application. Interfaces should also give you a common user interface. The best interface should also inform you of how much time you've spent on-line, give you estimates of how long a particular download will take, and let you run Internet programs simultaneously.

ered. What's left? The features each solution offers and the relative quality of those features.

Mail capabilities are essential in any Internet access tool. Effective products, though, offer address aliasing (to turn complex addresses like *sjvn1@vna.access.net* into manageable addresses like *sjvn*), address books, a full-screen editor with at least Windows' Notepad functionality, mailing lists, and binary attachments.

Newsgroups provide you with groups of messages tied to a common theme such as health care and (for the network manager) router management. They are the equivalent of the on-line services' discussion groups. Lack of a good interface makes it extremely easy to waste time chasing newsgroup messages. Top newsreaders

give you a single integrated, read/write interface and the ability to 'kill' unwanted threads. They also allow you to save messages to your PC.

Mail and newsgroups are nice, but the heart of the Internet is finding and retrieving critical information. Retrieving is the easy part. Use FTP. The ideal interface would make copying a file from a remote computer as easy as moving a file with File Manager.

More problematic is finding the file you want to transfer. There are many tools for this job, includingarchie, Gopher, WAIS, and the World-Wide Web. (For more information, see "Quest for Knowledge: Internet Information Resources.")

So for the user starting out using an asynchronous line, what's the best choice? We say Pipeline for Windows V1R3.5. Users bent on sending mail or accessing newsgroups have an obvious choice, too—Winnet Mail and News. For users who only want to find information, Mosaic—even though it is slow—may be the solution.

America Online Inc.

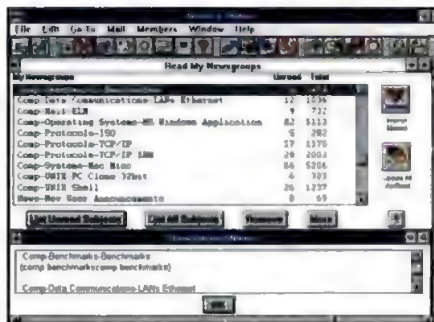
• AOL for Windows, Version 1.1

Most of you already know America Online as one of the most popular on-line services. What you may not know is that AOL now supports Internet e-mail and Usenet newsgroups. AOL provides additional Internet services,

including Gopher and WAIS, on a test basis (until the services become fully operational). AOL also plans to bring telnet (a terminal-emulation protocol) and FTP capabilities to its service as soon as possible.

AOL's strong

point is its newsgroup reader. The newsgroup reader makes it extremely easy to follow or drop discussion threads. While Pipeline and Winnet also provide the same capability, AOL's overall interface is more user-friendly. AOL lists threads by subject, for example, so following



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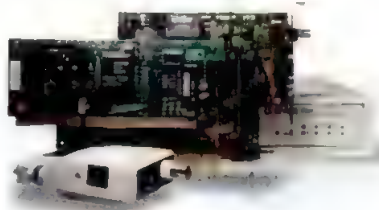
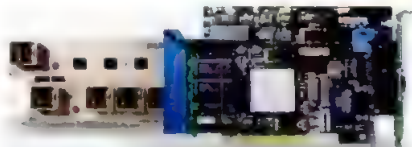

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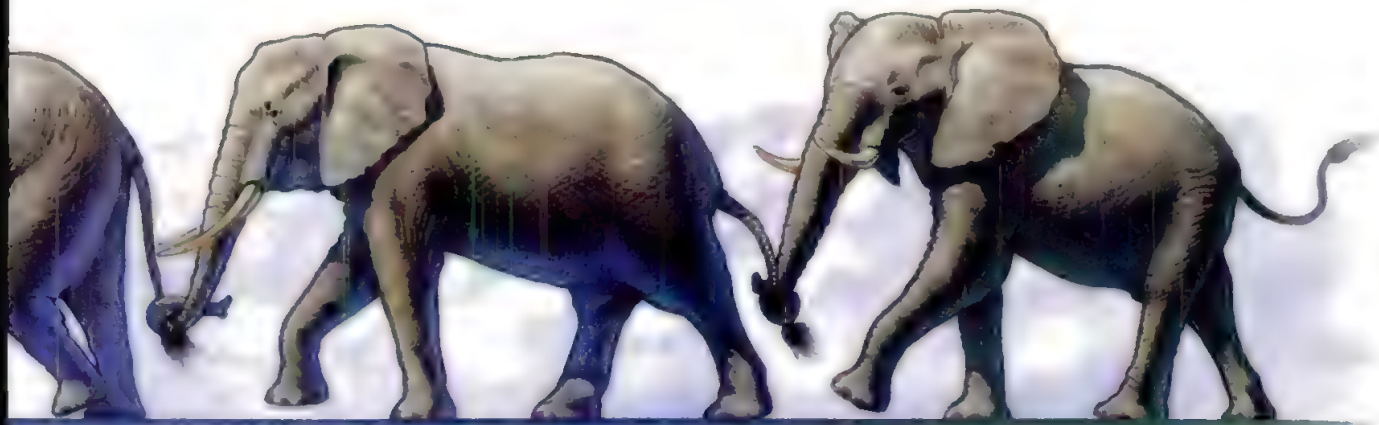


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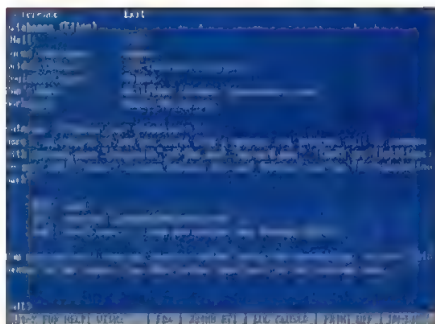
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newsgroup threads is actually easier than following threads in AOL's own forums. AOL also does users a service by putting message headers into the bottoms of messages so arcane mailer information won't waste your time. There is room for improvement, however. Instead of using the more effective vertical scroll bar to continue in a thread or message selection boxes, you must double-click on the "more" button, which is slightly harder to use and somewhat annoying to experienced Windows users.

AOL's e-mail features also work, but there are two flaws. On the plus side, AOL supports address aliasing and an address book, multiple addresses, and mailing lists. Another win is that if you know how to use Notepad, you'll know how to use AOL's editor. Its drawbacks are that you can't forward messages and you can't send binary files such as Excel files to Internet mail addresses.

At this early stage, it appears that AOL is on the right track with its approach to Internet tools. Gopher and



SIMPLE BUT SUAVE: Delphi's ASCII menus are much easier to use than Internet commands.

WAIS were both easy to use with the AOL GUI. You can find files, but you can't download them. Until further capabilities are built in, AOL is not a file-hunter's service.

AOL also has other problems that may make potential customers wary.

The system's tremendous growth rate has outstripped its performance. In short, AOL may eventually have a great tool for Internet access. For now, you can do better elsewhere.

Delphi Internet Services Corp.

● Delphi

Delphi was the first major on-line service to offer Internet access. The service's character-based menu system reflects its age. Still, it's a great step up from a raw Internet interface.

For a newsreader, Delphi uses the Internet standard newsreader program, nn. nn is powerful, but it is command-driven rather than mouse-driven. There's no question that it's more difficult to use than Winnet's or Pipeline's newsreaders.

There's nothing fancy about Delphi's Internet mail system. It's barely a step up from Internet mail programs like elm and pine. Still, it's perfectly usable.

Delphi's e-mail system does the basics well. While it lacks such bells and whistles as mail filtering, it does enable you to send blind cc: messages and binary files. Its real drawback is the editor—VAX-VMS's EDT full-screen editor.

DOS and Windows users will find it difficult going. EDT is one reason that Delphi will soon be adopting InterNav.

For retrieving files and information, you must use the unadorned Internet programs such asarchie, FTP, Gopher, telnet, and

► FACT FILE

Delphi

List price: Software is free; Monthly fee, \$23 (20 free hours); Time fees, \$1.80 per hour. **Requires:** PC, any communications program, and modem. **In short:** Is there still room for a good character-based interface in today's Windows world? The answer is "yes." Delphi's greatest asset is that it can be used on any PC. Perhaps its only drawback is that its interface is somewhat primitive and using it can be time-consuming. Inexpensive service and a simple menu system make Delphi a must for users with older computers or limited on-line budgets.

SUITABILITY TO TASK

Delphi Internet Services Corp., 1030 Massachusetts Ave., Cambridge, MA 02138; 800-695-4005, 617-491-3393; fax, 617-491-6642.	News retrieval	FAIR
968 on reader service card	E-mail	FAIR
	Information/File retrieval	POOR
	Installation/Ease of use	FAIR

WAIS. These are very powerful but require a large investment of time and study. If you're the kind of user who remembers how to format 360K disks in a 1.2MB floppy disk drive in MS-DOS, you're the sort of user who can enjoy Delphi.

BIX

● InterNav, Version 2.0

InterNav, Version 2.0, is a Windows-based program that serves as an interface to the BIX on-line service and its Internet connections. In the near future, there will also be a Delphi version of InterNav.

Learning how to use the InterNav interface is like exploring a room in the dark. You can't see much so you have to feel your way around. Once you've gotten over the initial stumbling blocks, however, InterNav does have its charms.

InterNav shines when it comes to retrieving information. It directly supports telnet (for logging onto remote systems), FTP, and Gopher. You're never too far away from the Unix command line with InterNav. For example, to use FTP you can enter FTP com-

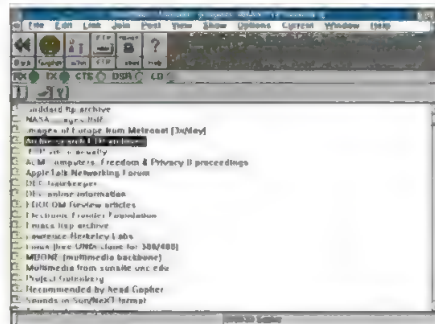
► FACT FILE

AOL for Windows, Version 1.1

List price: Software is free; Monthly fee by credit card, \$9.95 (5 free hours), by bank-account debit, \$11.95 (5 free hours); Time fees, \$3.50 per hour. **Requires:** PC running Microsoft Windows, 4MB RAM, and modem. **In short:** With one foot in the Internet and one foot out, America Online uses its well-known, highly attractive GUI to open a doorway into the Internet. The good news is that AOL handles Usenet newsgroups better than it handles its own discussion areas. Usenet groups are easy to manage with AOL. The bad news is that other problems with the discussion-area interface still persist. Users new to on-line services will find America Online the easiest introduction to the Internet.

SUITABILITY TO TASK

America Online Inc., 8619 Westwood Center Dr., Vienna, VA 22182, 800-827-6364, 703-448-8700, fax, 703-883-1509	News retrieval	EXCELLENT
969 on reader service card	E-mail	GOOD
	Information/File retrieval	POOR
	Installation/Ease of use	FAIR



GO FOR GOPHER: InterNav uses Gopher to search the Internet easily.

There Are Two Times When Modem Reliability Is Critical.

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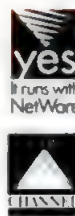
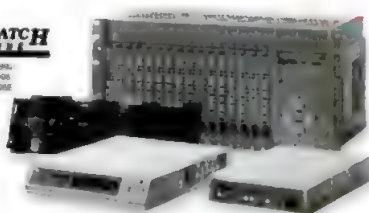
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CIRCLE 927 ON READER SERVICE CARD

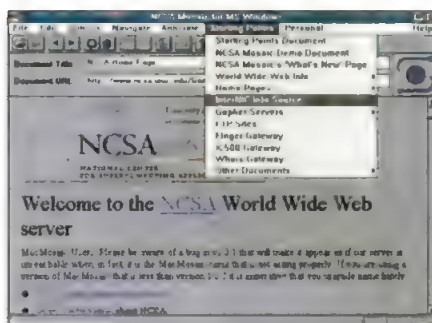
mands in a command line window. Unix commands can be intimidating, but InterNav's graphical interface makes the Internet easy to use. This is apparent in its ability to retrieve files. As FTP brings in the first bytes of data, InterNav automatically starts sending the bytes to you via data transfer protocols such as Zmodem. Pipeline is the only other tool that can duplicate this utility.

The program runs roughly at times. Commands that you can't run in a given situation, like telnet when you're logged off, show up in the menu highlighted as if the command could work. It doesn't. Closing an InterNav window in other instances sometimes does not deactivate ongoing programs.

If your interest is in Usenet newsgroups, then you should pass on InterNav. While you can get an Internet native newsreader program such as trn or nn to run, it's hardly worth the effort. According to Delphi, once InterNav moves onto its service, newsgroups will be supported.

While BIX offers basic e-mail capabilities, it does not have features like address aliasing, message filtering, and binary attachments to non-BIX addresses. This might prove annoying to the more demanding user.

Installing InterNav can be difficult. Getting the program to talk with



POWER SEARCH: Mosaic's hypertext interface offers more power than you'll ever need.

SprintNet and then BIX, for example, is somewhat challenging. Veteran telecommuters won't have much trouble, but data communications newcomers should steer clear of InterNav.

Like America Online's interface, InterNav has promise. For now, though, only telecommunications power users and present BIX and Delphi customers should stop here. The rest of us should keep on looking.

National Center for Supercomputing Applications

• Mosaic for Windows, Version 2.0 Alpha 3

Mosaic's the one Internet interface that almost everyone knows. That's a pity, because while it's an extraordinary program and can do things that other Internet front ends can't, it's not a full-service Internet tool at all. Newsgroups are barely usable, and e-mail is essentially nonexistent.

Then there's the Mosaic installation process. You'll need Version 1.1 of the winsocket.dll, Win32s (the 32-bit API for Windows, Version 3.1), access to TCP/IP utilities, a network connection to the Internet, and Mosaic.

Putting this all together is like building a house of cards: Make one wrong move and everything you built will just collapse around you. Finally, you must have service from a local Internet POP.

▪ Quest for Knowledge: Internet Information Resources

How do you find the information you want? With a cast of characters with names likearchie, Gopher, veronica, WAIS, and the World-Wide Web.archie and Gopher let you browse the Internet for files, WAIS lets you search for information inside databases, and the Web is a hypertext system that combines searching and browsing. Here are the details.

archie—not the comic book character—is a client/server database-management system that indexes FTP sites and their publicly available Internet files. Ifarchie is too difficult to use, try another solution: Gopher. Gopher is a menuing system that contains access toarchie information, on-line services, other public-access library catalogs, and interactive games.

Because there are hundreds of Gopher servers, finding the Gopher menu you want can be a real hassle.

Enter veronica. veronica (or Very Easy Rodent-Oriented Netwide Index to Computerized Archives) indexes all known Gopher menus, cutting down on the time it takes to search through Gopher.

For getting around the Internet, Gopher is fine, but to find information in some indexed database,archie, Gopher, and veronica will not help. WAIS may be the solution. WAIS (Wide-Area Information Server) offers keyword searching through a variety of indexed databases. Select the database and the WAIS server executes the search.

One last tool, which lets you browse linked topics on the Internet, is the World-Wide Web browser. Web browsers—Mosaic, for example—let you access a hypertext system to search using a trail of related topics.

—Steven J. Vaughan-Nichols

► FACT FILE

InterNav, Version 2.0

List price: Software is free; Monthly fee, \$13; Time fee, \$20 per 20 hours. **Requires:** Microsoft Windows, 4MB RAM, and modem. **In short:** InterNav is a little rough around the edges because of its slightly non-standard Windows interface. It is powerful and ideal for users who already know how to use the Internet but want some of the comforts of a GUI. InterNav does a good job of integrating its utilities with your system. On the downside, it is occasionally clunky. New users should steer clear of InterNav, but if an occasional visit to a command line doesn't scare you, give InterNav a try.

BIX, 1030 Massachusetts Ave., Cambridge, MA 02138, 800-695-4775, 617-354-4137; fax, 617-491-6642

967 on reader service card

SUITABILITY TO TASK

News retrieval	N/A
E-mail	POOR
Information/File retrieval	EXCELLENT
Installation/Ease of use	FAIR

N/A—Not applicable. The product does not offer news or e-mail support.

Few things can survive the elements without protection.



Your data is no exception.

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Matrix modularity means reliability

In some midrange UPSes, a small internal failure can bring down the whole UPS, and your system with it.

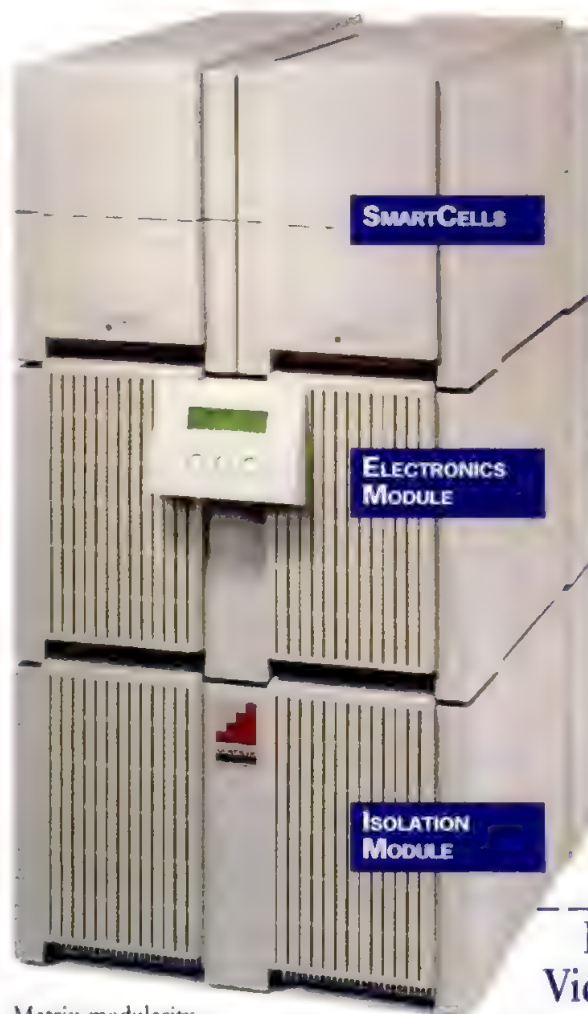
In contrast, the Matrix- "100% Uptime" design isolates any problems to their 'block' which can be diagnosed and hot-swapped-out while the protected system stays up and reliable.

No downtime. No service delays. No unnecessary risk. The fact is, Matrix delivers plug-and-play reliability no other UPS can match.

Matrix modularity means low operating and lifecycle costs

When you're rightsizing to conserve cash, the last thing you need is a UPS that wastes it.

Small footprint and low weight (each module can be shipped overnight) means Matrix can be hot-swapped out by even untrained personnel without the cost or delays of a service call.



3000 and 5000 VA protect up to 22 servers or 2 midrange systems

■ Hot-swappable modules for 100% uptime, 60% lower lifecycle costs



■ Microprocessor-controlled, zero-maintenance SmartCells end expensive service contracts. For more runtime, simply add SmartCells.

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■ Environmental and power monitoring provides "glass room" level security.

■ Two-year warranty, \$25,000 Lifetime Equipment Protection Guarantee (see details)

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Fax for your free video!

CIRCLE 915 ON READER SERVICE CARD

For most practical purposes, IP connections cannot be maintained over public data networks. If you are not a TCP/IP network administrator, don't even bother with Mosaic.

Why bother at all? Because once Mosaic, a World-Wide Web browser, is working, it opens up an entirely new world that comes straight from the pages of cyberpunk science fiction stories and novels. Mosaic lets you explore the Web wave of hypertext multimedia documents. With Mosaic, all Web information is at your beck and call.archie, Gopher, and WAIS also take on new life under Mosaic.

However, despite its obvious benefits, it also has a few problems. For instance, transferring data from the Internet to your own PC's hard disk is a cumbersome task. Transferring multimedia documents across a modem gives the word *slow* a new meaning: Even 28.8-Kbps modems are not fast enough.

Casual users will find Mosaic's incomplete hypertext references to be annoying. It's all too possible when tracking down information in the Web hypertext to end up endlessly looping around the heart of a subject. On the other hand, it is delightful how you can move smoothly from infor-

mation based in Indiana to a reference in Switzerland and then, still, in one smooth operation, get even more information from NASA. If you have the resources, and information retrieval is your game, you can't beat Mosaic.

Mosaic is in no way, shape, or form a program designed for everyone to use, but anyone who loves computing will enjoy it.

The Pipeline

• Pipeline for Windows V1R3.5

If it weren't for Pipeline, there wouldn't have been a Network Edition Editors' Choice. Winnet's great, but as a Usenet-only program it couldn't win total Internet acclaim. We might have told you



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D DATAPOINT

► FACT FILE

Mosaic for Windows, Version 2.0 Alpha3

List price: Software is free **Requires:** 386SX PC running Microsoft Windows, 4MB RAM, and modem (33-MHz 486SX PC running Microsoft Windows, 8MB RAM, and modem recommended). Version 1.1 of the winsock.dll; win32s for 32-bit applications to run under Windows, Version 3.1, TCP/IP connectivity **In short:** Mosaic, an Internet information browser and World-Wide Web client, is easily the most powerful Internet front end. It's also the most difficult to install. Once Mosaic is installed, most users will find it delightful, but it doesn't work well with news-groups, and it doesn't work at all with e-mail. People who love technology will love Mosaic.

National Center for
Supercomputing Ap-
plications, University
of Illinois, Cham-
paign-Urbana, IL
61820; 217-244-
0704.

966 on reader service card

SUITABILITY TO TASK

News retrieval	POOR
E-mail	N/A
Information/ File retrieval	EXCELLENT
Installation/ Ease of use	POOR

N/A—Not applicable. The product does not offer e-mail support.

SUMMARY OF FEATURES

Internet Access Tools

Products listed in alphabetical order

■ = YES □ = NO

PC MAGAZINE
NETWORK EDITION
EDITOR'S CHOICE

User Interface	AOL for Windows, Version 1.1	Delphi	InterNav, Version 2.0	Mosaic for Windows, Version 2.0A	Pipeline for Windows V1R3.5	Winnet Mail and News, Version 2.1
On-line service	America Online	Delphi	BIX	Any provider that supports IP	Pipeline	Winnet, any provider that supports UUCP
List price:						
Software	Free	N/A	Free	Free	Free	Free
Service:						
Monthly	With credit card \$9.95; via bank-account debit, \$11.95	\$23	\$13	N/A	□	\$9.95 (Winnet)
Hourly	5 hours per month free, then \$3.50 per hour	20 hours per month free, then \$1.80 per hour	20 hours, \$20	N/A	5 hours, \$15; 20 hours, \$20; unlimited use, \$35	Winnet \$10.80 per hour (prime time), \$7.20 per hour (other times)
E-mail	Free	Free	Free	Free	Free	Free
General Features						
Access offered	Usenet, limited Internet	Internet, Usenet	Internet	Internet, limited Usenet	Internet	Usenet
Connections supported	Dial-in	Dial-in	Dial-in	PPP, SLIP	pink slip	Dial-in
Maximum access speed	9,600 Kbps	9,600 Kbps	9,600 Kbps	14,400 Kbps	14,400 Kbps	14,400 Kbps
Environments supported	DOS, Macintosh, Windows	DOS, Macintosh, Windows	Windows	Windows	Windows	DOS, Windows
Internet Services						
Internet Relay Chat	□	■	□	□	■	□
FTP	□	■	■	■	■	□
telnet	□	■	■	■	■	□
Other services	Gopher, WAIS	archie, Gopher, nn newsreader, veronica	archie, Gopher, veronica	archie, Gopher, veronica, WAIS, World-Wide Web	archie, Gopher, veronica	□
Usenet Services						
E-mail address book	■	□	■	□	■	■
Binary attachments supported	□	□	□	□	■	■
Mail filtering	□	□	□	□	□	□

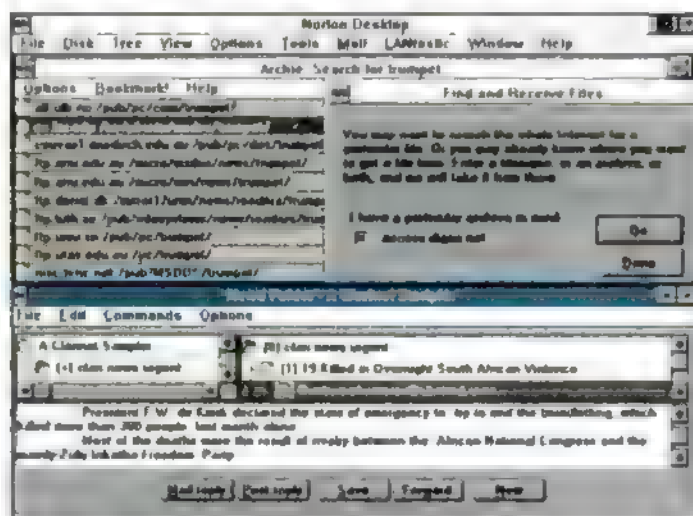
N/A—Not applicable: The product does not have this feature.

to wait for two upcoming Internet packages: Spry's Internet-in-a-Box (a packaged Mosaic product), or Mortice Kern Systems' Internet Anywhere (another all-in-one Internet access package). But with Pipeline, there's no need to wait. It's already a top-notch Internet interface.

Pipeline's news-group interface is first-rate. It makes reading, replying, and starting new topics almost mindless. You can also search for messages by phrase and author, copy information to Microsoft Windows' Notepad, and easily work

with message threads.

There's little to find fault with in the e-mail department. Pipeline gives you binary transfers, an address book and aliases, multiple mail folders, and mail-search capabilities. It also features signature blocks and the ability to hide header information.



EASY AS PIPELINE: Pipeline's interface makes searching for topics almost mindless.

FACT FILE

Pipeline for Windows V1R3.5

List price: Software is free; Time fees, \$15 per 5 hours, \$20 per 20 hours, \$35 unlimited hours. **Requires:** Microsoft Windows, 4MB RAM, and modem. **In short:** Pipeline for Windows gives both the new and the experienced Internet explorer all the gear they need to venture into the dark forest of the Internet. Pipeline manages to be easy to use while giving you access to the full range of Internet services. Only Pipeline gives you the ability to multitask Internet searches from a single display. However, its Windows interface still shows a little bit of clutziness. Occasionally it does not clear off some of the old Windows displays.

SUITABILITY TO TASK

The Pipeline, 150 Broadway, #1710, New York, NY 10038; 212-267-3636; fax, 212-267-4380. \$65 on reader service card

News retrieval	EXCELLENT
E-mail	EXCELLENT
Information/File retrieval	EXCELLENT
Installation/Ease of use	EXCELLENT

supporting SWAIS, a character-based WAIS client. Pipeline offers a simple to use interface to Internet Relay Chat (IRC), a method of conducting real-time communications. Pipeline left the other interfaces eating its dust with its ability to run multiple simultaneous programs over an ordinary modem connection.

However, Pipeline is not flawless. Its speed is noticeably slower than the other GUI-based programs. Also, it doesn't do a good job of cleaning up unneeded windows.

With all that taken into consideration, Pipeline's still the program to beat. Internet access tools are evolving at a rapid rate. For now, the clear winner is Pipeline for Windows.

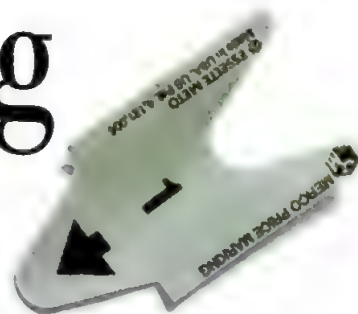
Computer Witchcraft Inc.

Winnet News and Mail, Version 2.1

So all you want is Usenet access? Look no further. Computer Witchcraft's Winnet will hold you spellbound. Winnet is purely an off-line reader. Very little time is spent on-line, so in turn, you spend very little money. One of Winnet's charms is that if you use Computer Witchcraft's POP, it's free. If you already have a POP, you can buy the Winnet interface for \$99.

Computer Witchcraft does a bang-up job on newsgroups. You can perform both inclusive and exclusive text searches, a ser-

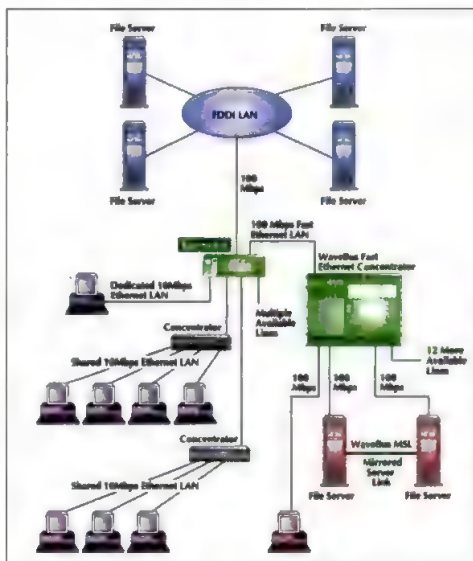
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The Complete Network Solution

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When faxing, the server makes use of all of the shared fax-modems in the modem pool for receiving or for simultaneous broadcast faxing to multiple recipients. Incoming faxes can be automatically or manually routed. It can keep track of all faxes and data transfers through powerful administrative options including full reporting, logging, and diagnostics.

The Eclipse Fax and Terminal Plus clients co-operate seamlessly with the fax & communications server. The integration in Windows is so discrete and so transparent that users won't even know they are using a shared network modem.

Most importantly, there are no TSR's stealing valuable memory and hidden under Windows.

The Award Winning Eclipse Fax with OCR
Eclipse Fax for Networks allows multiple users to forward faxes to the fax server for onward transmission. This lets users get back to work quickly without waiting for their fax software to finish transmitting from their workstation. Users can command all of Eclipse Fax's powerful features including the built-in OCR plus new network ready features including network based multi-user phone books, network attachments, and bulk faxing.

The Award Winning Terminal Plus

Terminal Plus for Networks supports all the popular terminal emulations, file transfer protocols and all the different types of modems. Its the best way to connect quickly and reliably to all of the popular online services including CompuServe, Dow Jones, the Internet... Terminal Plus for Networks has all of the great features both novices and experts want in an easy to use and network ready data communications software.

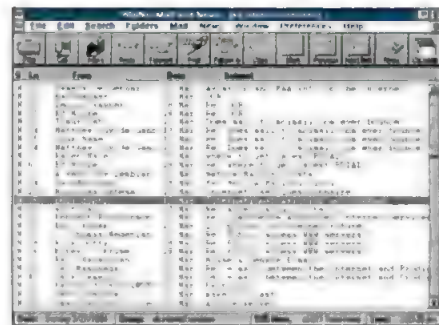
The Economical Solution

The Best Fax & Communications Suite for Networks is also the best value. Call today.



vice only Winnet provides. You can also save message threads to folders easily.

Winnet excels in its e-mail capabilities. Its folder system lets you store your mail quickly and in an orderly fashion. You can also send and receive binary attachments,



USENET FRIENDLY: Winnet gives you Usenet access with its easy-to-use interface.

keep address aliases and books, and perform mail text searches. You can queue up your outgoing messages, and Winnet will send and receive mail on a schedule.

Winnet is an excellent mail and newsgroup front end. Unfortunately, its Internet tools consist of using mail workarounds to access FTP sites andarchie servers. Even so, for many users, Winnet is all the Internet they'll ever need.

STEVEN J. VAUGHAN-NICHOLS is a contributor to *PC Magazine* and an on-line columnist for *Computer Shopper*.

► FACT FILE

Winnet Mail and News, Version 2.1

List price: Software is free; Monthly fees, \$9.95; Time fees, \$10.80 per hour (prime time), \$7.20 per hour (non-prime time). **Requires:** Microsoft Windows, 4MB RAM, and modem. **In short:** Are Usenet newsgroups and E-mail all you really want? If your answer is "yes," then Winnet is the program for you. Its clean, simple design with extensive off-line reading capacities makes Winnet perfect for users who want to make the most of local Internet service providers. Its only drawback is that its offerings are purely Usenet, not Internet.

SUITABILITY TO TASK

Computer Witchcraft Inc., 330F Distillery Commons, Louisville, KY 40206-1919; 800-589-5999, 502-589-6800; fax, 502-589-7300.	
News retrieval	EXCELLENT
E-mail	EXCELLENT
Information/File retrieval	POOR
Installation/Ease of use	GOOD
964 on reader service card	

LANSource Tel: (800) 677-2727, (416) 535-3555; Fax: (416) 535-6225

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CIRCLE 940 ON READER SERVICE CARD



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It's the kind of quality and service you'd expect from a company whose hubs connect more than 10 million nodes. A company whose other workgroup hubs—the Lattis System 2000™ series—just earned the PC Magazine Editor's Choice Award.

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The same goes for the 810M model. For only \$799 list price, you get SNMP management over IP and IPX network protocols.

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SynOptics

Building the Network Fabric

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ANIXTER



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CIRCLE 947 ON READER SERVICE CARD

▶ NETWORK MANAGEMENT

McAfee Offers an Integrated Management Compromise

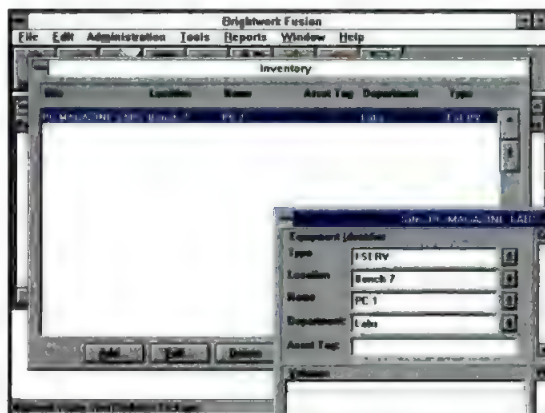
BY O. RYAN TABIBIAN

McAfee Associates' Brightworks addresses the basic need of every network administrator: to keep track of what's running on the network. However, Symantec and Saber Software both target the same market, and each offers a product that is more expensive than Brightworks but offers more features.

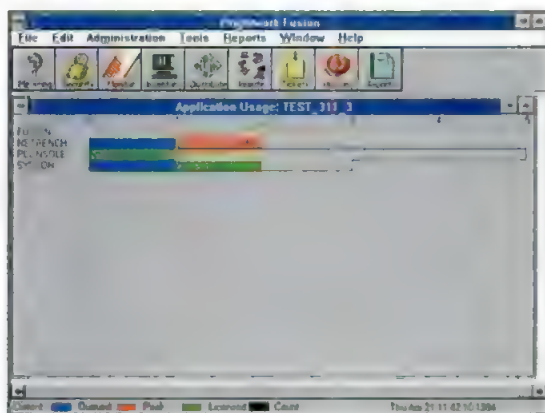
Brightworks, originally sold as Fusion by Brightwork Development before that company was bought by McAfee, targets a market currently addressed by two categories of products: separate utilities that handle metering, inventory, and distribution (from vendors such as Frye Computer Systems) and packages that combine these features in an integrated utility (like The Norton Administrator for Networks and Saber LAN Workstation with Saber Enterprise Applications Manager, or SEAM).

By combining hardware and software inventory with software metering and distribution in one package, Brightworks offers a level of convenience not matched by the individual utilities. Compared with other integrated packages, however, Brightworks faces much stiffer competition.

The Norton Administrator (\$5,166 for 100 users) is considerably more expensive than Brightworks (\$1,499 for 100 users) but it also provides more features. Some examples are its metering of client applications and a platform-independent architecture that allows it to run on any of the popular network operating systems including NetWare, VINES, and IBM LAN Server. Saber LAN Work-



AT A GLANCE: Brightworks' inventory features make it easy to see what hardware and software reside on your LAN.



ON THE METER: Multicolored graphs help you track usage of server-based applications.

station with SEAM (\$4,735 for 100 users; see "A Meter Reader for the Enterprise") is also more expensive than Brightworks, but it supports metering of multiserver licenses in addition to offering many of the same features as Brightworks and The Norton Administrator. Of the three products, The Norton Administrator provides the superior user interface, which is easiest to use primarily because it provides an easy-to-

understand method of accessing the product's many features.

FEATURE BY FEATURE

Brightworks' hardware-inventory module collects detailed information from any or all PCs or Macs on a network and stores the data in a common database format that can be used to generate reports within Brightworks or exported to other applications such as dBASE, FileMaker Pro, and Microsoft Excel.

Both The Norton Administrator and Saber LAN Workstation provide similar hardware-inventory capabilities.

The software-inventory module scans each client's hard disk and provides a detailed report on all applications. Brightworks' database of product specifications allows it to recognize 2,000 software applications. You can also add software products to customize the list. The Norton Administrator offers a similar database (1,500 entries), while Saber LAN Workstation provides a more limited list (900). Both The Norton Administrator and Saber LAN Workstation allow you to customize the application database.

Brightworks' software metering allows network administrators to monitor the number of software licenses that are running on the network. This data can be used to indicate trends; administrators can plan software purchases based on average usage. Brightworks also provides an impressive reporting feature for the metering data. But metering

can be performed only on applications that are launched from the server; Brightworks does not meter applications that run on network clients. On the other hand, The Norton Administrator provides metering of client-launched applications through a TSR on each client. With SEAM, Saber LAN Workstation not only tracks client applications but also provides the unmatched ability to meter

Continues on page NE24

McAfee Associates

CONTINUED FROM NE23

licenses over multiple servers in both LAN and WAN environments.

The software distribution feature is useful because it can not only install software from a central console to clients located anywhere on your network, but it can also update client system files such as AUTOEXEC.BAT or CONFIG.SYS as necessary. Brightworks' software distribution provides a powerful filtering scheme through which you can specify the criteria a client must meet before certain software is installed. For example, you could set a filter to install CAD software only on PCs with at least a 486 CPU and 16MB RAM. This feature is also ideal for updating client shell drivers on any PC on the network. The Norton Administrator offers similar filtering capabilities for software distribution, but

Desktop Management Packages

	Brightworks, Version 1.0	The Norton Administrator for Networks, Version 1.0	Saber LAN Workstation, Version 2.0, with SEAM NLM
List price (100 users)	\$1,499	\$5,166	\$4,735
Software metering	■	■	■
Client applications	□	■	■
Software suites	■	■*	■
Multiserver licenses	□	□	■
Software inventory	■	■	■
Number of applications recognized	2,000	1,500	900
Customizable database	■	■	■
Hardware inventory	■	■	■
Software distribution	■	■	■

* Suite applications must be in the same directory

Saber LAN Workstation's filtering is much more limited.

Other features provided by Brightworks include notification, which integrates with Lotus's cc:Mail and lets you either launch cc:Mail or send a message to alert users of impending software updates. It also supports a paging feature, through which it can send the administrator notification of specific net-

work events, such as failed remote installation, via an alphanumeric or digital pager. Neither The Norton Administrator nor Saber LAN Workstation provides e-mail integration or paging.

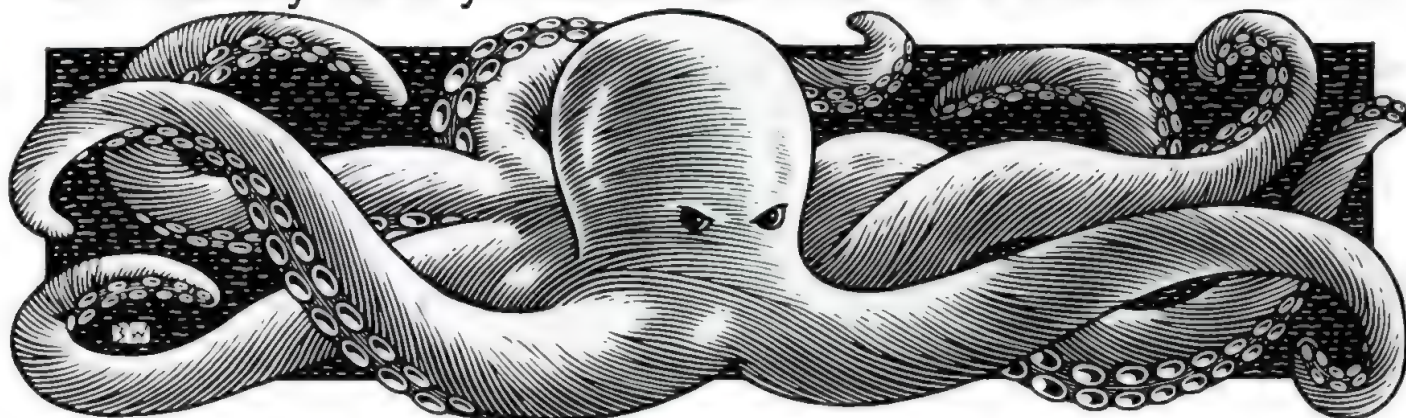
Overall, Brightworks provides a solid combination of desktop management features. Its features are not as extensive as those of other integrated packages. But although The Norton Administrator for Networks offers client software metering and better overall ease of use, while Saber LAN Workstation with SEAM has a much lower initial cost

and offers a unique multiserver license metering feature, Brightworks provides an excellent range of features for a much lower price.

► **Brightworks, Version 1.0.** List price: 100-user version, \$1,499; 250-user version, \$2,999. McAfee Associates, 766 Shrewsbury Ave., Tinton Falls, NJ 07724; 800-552-9876; fax, 908-530-0622.

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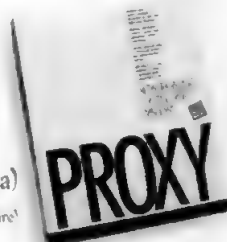
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	SABER LAN WORKSTATION	SYMANTEC NORTON ADMINISTRATOR	INTEL LANDESK MANAGER
DOS & Windows Menuing	Yes	No	No
Application Metering	Yes	Yes	No
File & Software Distribution	Yes	Yes	No
Hardware Inventory	Yes	Yes	Yes
Software Inventory	Yes	Yes	Yes
.INI File Management	Yes	No	No
Printer Management	Yes	No	Yes
Disk Monitoring	Yes	No	Yes
Alarm Notification	Yes	No	Yes
Scripting Language	Yes	Yes	No

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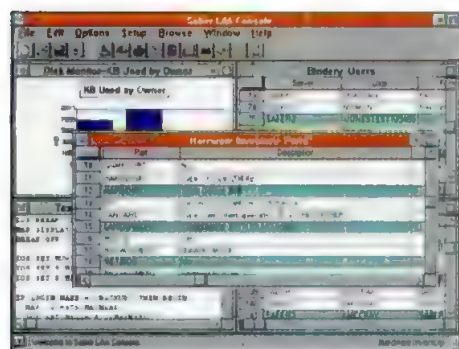
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Saber LAN Workstation is compatible with Novell NetWare, Microsoft LAN Manager, Banyan Vines, DEC PathWORKS, IBM LAN Server, Artisoft LANtastic, MS-NET based-networks and Windows for Workgroups. Saber Software Corporation 5944 Luther Lane, Suite 1007 Dallas, Texas 75225 214-361-8086 FAX 214-361-1882

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CIRCLE 856 ON READER SERVICE CARD

► TEST EQUIPMENT

Fluke Combines the Best in Testing

BY PADRAIC BOYLE

Fluke Corp.'s Fluke 675 Combo LANMeter represents a breakthrough in LAN troubleshooting tools: This \$8,995 unit is the first to let you analyze protocols, test cable, and test the physical connections of individual nodes on both Ethernet and Token-Ring networks in a single battery-operated, hand-held unit.

There are plenty of other hand-held testers on the market, such as Microtest's PentaScanner, but they are all designed to test either Token-Ring or Ethernet—not both. The 675 not only tests both, but it provides a comprehensive suite of tests that commonly require multiple devices. For example, tracing a traffic problem often requires hauling an expensive, cumbersome protocol analyzer from wire closet to wire closet, while tracing a physical problem usually requires a separate cable tester.

The 675 does not replace all other testing tools, and on large networks you'll probably still need a high-end protocol analyzer such as Network General's Notebook Sniffer Analyzer to perform packet filtering and other tasks. But it combines the most common tools, providing a fast, efficient way to locate problem areas and check faulty cabling.

The 675 is part of a family of LANMeters; others in the series include the 670 for Token-Ring and the 672 for Ethernet (\$5,995 each). Each provides most of the tests offered by the 675 but is intended for a homogeneous environment.

THREE-IN-ONE

The 675's capabilities can be broken down into three distinct categories, each of which is usually addressed by a dedicated product: protocol analysis, cable testing, and node testing (in which the 675



TESTING TOOLKIT: The Fluke 675 Combo LANMeter provides an array of tests for both Token-Ring and Ethernet networks.

assumes a particular node's location on the network and tests that node's physical connections).

Like most protocol analyzers, the 675 monitors network protocols and indicates the percentage of the network each is using. Some of the Token-Ring problems the 675 detects include slow token-rotation, which alerts you that a Token-Ring LAN is operating slower than usual, and *beaconing* nodes, which are illegal nodes (such as a 16MB Token-Ring client on a 4MB network) attempting to transmit data. Ethernet problems detectable by the 675 include short frames—or *runts*—that are smaller than the standard 64K Ethernet packet, and *jabbers*, which are malfunctioning network adapters or drivers that send a continuous stream of data and clog up the network. (Jabbers can occur on Token-Ring LANs but are more prevalent on Ethernet networks.) During our tests, we located several beaconing nodes on our own network and tested for generic network errors such as packet collisions and node removals (network devices disconnected from the network).

The 675 also offers information on network statistics, error statistics, and the usage of up to seven protocols on a LAN, including AppleTalk, IPX/SPX, TCP/IP, and VINES. Even though the 675 provides the same basic features as some of the more expensive analyzers, its features

What the Fluke 675 Combo LANMeter Shows You

Network Type	Test	Description	Problems Identified
Ethernet	Error statistics	Identifies type and source of Ethernet frame errors (jabbers, short frames, bad cyclic redundancy checks)	Faulty adapters, bad cabling and hub ports, too many repeaters
	Collision analysis	Measures amount of bandwidth consumed by collisions	Faulty adapters, bad cabling, line noise
Token-Ring	Beacon detection	Identifies beaconing (or illegal) nodes	Bad cabling, faulty adapters and MAU ports
	Error statistics	Identifies type and source of various Token-Ring errors (lost frames or tokens, for example)	Faulty adapters and MAU ports, line noise, bad cabling
	Token-rotation speed	Measures the amount of time required for the token to travel around the ring	Excessive cable lengths, too many repeaters
Both Ethernet & Token-Ring	Network statistics	Displays network utilization, errors, and broadcasts	Excessive traffic, bad cabling, faulty adapters
	Protocol mix	Displays a list of protocols and the stations transmitting them	Improperly configured or located stations
	Traffic generation	Produces AppleTalk, IP, or IPX background traffic	Bad cabling, improperly configured bridges or routers
	NetWare statistics	Tracks amount and source of NetWare-specific traffic (file requests and print jobs, for example)	Improperly configured client software, overburdened servers
	TCP/IP monitor	Provides type and source of Internet Control Message Protocol packets	Overburdened stations, improperly configured clients and routers, faulty routers
	Cable	Identifies type and distance to various cable problems	Shorted wires, bad cabling, split pairs, improper cable type

Table prepared from information provided by Fluke Corp.

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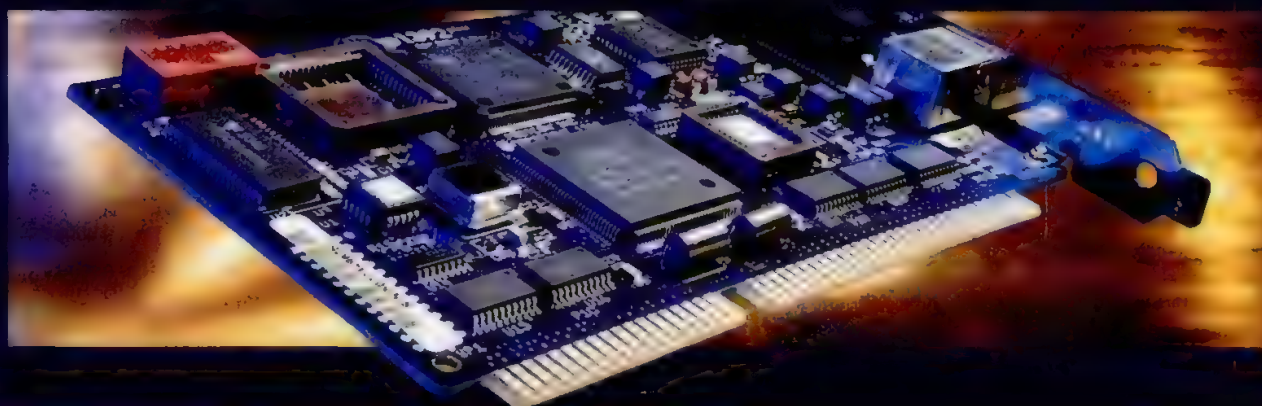
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CONTINUED FROM NE26

are not quite as robust. For example, the 675 lacks a packet-filtering function, which allows you to focus on traffic between two particular nodes or using a particular protocol. Without it, the task of tracking down problematic packets on a large network can be quite a chore. The 675 is also limited to viewing the lower three layers of the Open Systems Interconnection stack, which means that it can monitor only physical network problems (such as faulty cabling) and low-level packet statistics (such as how many IPX packets traverse a given connection). The 675 cannot, for example, decode packets, a process that can yield more detailed error information.

You can also use the 675 to determine which nodes are sending and receiving the most traffic. This data can be exported to a PC or printed through a parallel connection. On-board flash memory can be upgraded with software from Fluke via a

serial connection.

The 675 excels as a cable tester, which is critical because the majority of network problems in almost any organization are caused in some way by faulty cabling. The 675's comprehensive list of cable tests includes near-end crosstalk (NEXT, which senses excess noise on the cable), line impedance, resistance (caused by unusually long cable segments), and open, shorted, or split wire pairs. Another plus is that all of this can be done without putting another tester on the other end of the cable being evaluated (which is normally required). There is also a cable identifier feature that lets you store information for up to 13 kinds of cable on your network and a wire map feature that will check the cable for errors and display the pin configuration of individual wire connectors.

Node testing is another area in which the 675 shines. Through a unique feature called the Expert-T auto-test, the 675 evaluates the connection between itself and a hub, then tests the connection

between the workstation and 675 and displays the results on the screen. By testing both ends of the network path, the 675 lets you determine whether the problem lies with the network adapter, the hub, or the cable. Other node-testing information provided by the 675 includes *phase jitter* (commonly found on Token-Ring networks), which is noise that can distort packets and cause errors, and a brief analysis of the collisions found on the network.

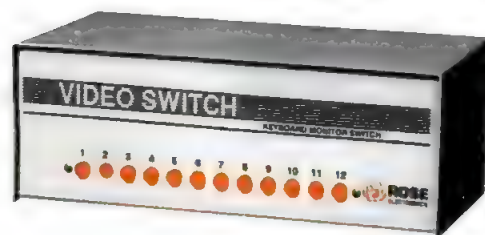
The 675's ability to perform some protocol analysis and offer cable and node testing from a single device makes it extremely useful as a LAN troubleshooting tool. It may not perform every kind of network testing, but it addresses all the basic problems and is probably good enough to satisfy most network requirements.

► **Fluke 675 Combo LANMeter.** List price: \$8,995. Fluke Corp., Box 9090, Everett, WA 98206-9090; 206-347-6100; fax, 206-356-5992.

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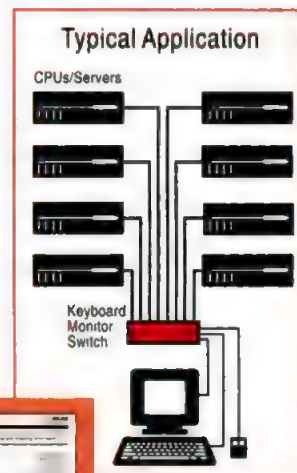
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CIRCLE 948 ON READER SERVICE CARD

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work this well together

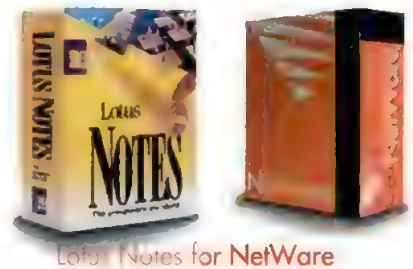


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The Past, Present, and Future of Network Computing.

► NETWORK UTILITIES

HawkNet Keeps Your Network in Tune

BY JEFFREY D. BAHER

HawkNet's NetTune, Version 1.1, is the first product that lets you use NetWare's powerful performance-tuning features with an easy-to-use Windows interface. NetTune allows you to keep an eye on your

servers and provides a centralized utility from which you can adjust the configurations of all your servers to keep them healthy and productive. However, NetTune does not support all of NetWare's server commands.

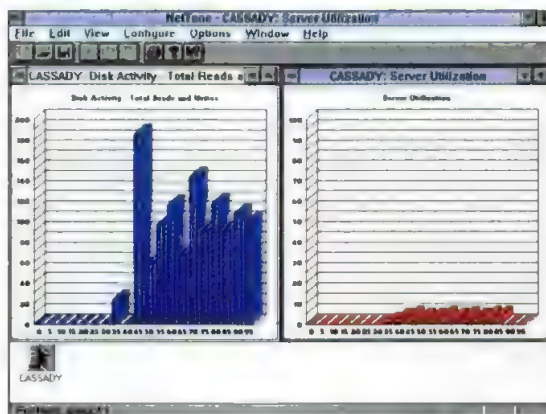
The \$695 utility includes an NLM and a Windows client application. Together, these two applications monitor a variety of server conditions normally available only through NetWare's built-in MONITOR module. NetTune also allows you to adjust a server's performance parameters, providing an alternative to the RCONSOLE module (another built-in NetWare utility).

The NetTune client application automatically discovers all servers on the network running the NetTune NetWare Loadable Module (NLM). The administrator can query a particular server simply by selecting it from the list of discovered servers and monitor it in either real-time or historical mode. In historical mode, all monitored data is saved to a file that can be viewed later and exported to another application for reporting.

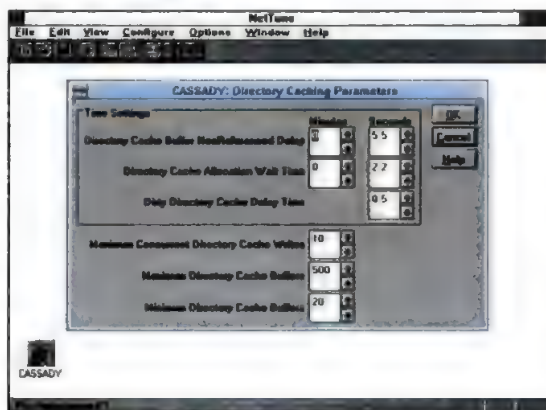
The Monitor function has five categories: server utilization (percentage of CPU in use), network activity (total number of packets transmitted and received), disk activity (total number of reads and writes), volume utilization (total megabytes of disk space in use), and connections (total number of connections in use). It presents data in list form or customizable graphs, which include 3-D bar graphs that we found very helpful when

tracking our server's utilization.

NetTune can act as a centralized server-monitoring utility by checking multiple servers simultaneously. If you are just trying to monitor one server, though, and you can live without NetTune's graphs, you may find that either MONITOR or



PROGRESS REPORT: NetTune's 3-D bar graphs make it easy to monitor a server's performance.



PUSH-BUTTON CONFIGURATION: The Windows interface allows for simple modification of server parameters.

RCONSOLE is just as effective though much less intuitive.

NetTune displays all parameter settings in a format that is easy to understand. The manual is extremely helpful in defining the different parameters.

NetTune supports tuning of a wide range of parameters ranging from file and disk cache settings to memory configuration and transaction tracking. Novell has

not yet made all of NetWare's tuning parameters available to third-party developers. This means NetTune can monitor all of NetWare's parameters but cannot change them all since they are labeled *read-only* by the operating system. Those parameters, such as "Set Maximum Physical Receive Buffers," must be modified in the NetWare start-up files using the NetWare text editor. NetTune displays all available parameters, marking those that cannot be modified via NetTune with an asterisk. Adjustable parameters are changed by simply typing in a new value or selecting one from a pull-down list. If you ever need to return a server to its original settings, NetTune includes a "reset to default values" command.

NetTune also provides a Preferences function through which the administrator can create *tune* files that include specific parameter settings. Instead of adjusting every parameter every time a particular server is tested, you can open the tune file for that server instead. As a complement to the tune files, NetTune also offers *timed tunes* that let you schedule changes in tune files so that your network can be optimized to perform certain jobs at certain times. For example, you might schedule a timed tune to set the parameter "Set immediate purge of deleted files" to *on* (so that deleted files won't be backed up, speeding up the backup and preserving space on the backup media).

NetTune delivers a simplified view of NetWare file server activity and brings some of NetWare's seldom-used features to the masses. While NetTune doesn't let you modify all tuning parameters, it is a very useful tool for large, multiple-server environments. Administrators of smaller networks may find Net-

Tune's centralized monitoring unnecessary and would probably be better served by a few hours learning how to use MONITOR and RCONSOLE more effectively.

► **NetTune, Version 1.1.** List price: \$695 per server. HawkNet Inc., 5962 La Place Ct., #101, Carlsbad, CA 92008; 800-429-5638; fax, 619-929-9969.

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► SOFTWARE METERING

A Meter Reader for the Enterprise

BY STEVE RIGNEY

Tracking all of the software on a single PC or a small LAN is not very difficult, but tracking software for 100 or more nodes or a WAN can easily become a full-time job. Saber Software's Saber Enterprise Applications Manager (SEAM) makes that job easier: It is the first utility to monitor software usage across multiple servers in both LAN and WAN environments.

SEAM, Version 1.0 (\$695 per server), is a NetWare Loadable Module (NLM) that runs under Version 2.x or higher of Saber LAN Workstation (\$179 plus \$39 per client), a desktop management software package for NetWare and other

major network operating systems, such as Microsoft LAN Manager and VINES (PC Magazine, February 22, 1994). SEAM enhances Saber LAN Workstation's software-metering functions to support metering of multiple servers.

The benefits of software metering are twofold. The most obvious is that it allows you to make sure your organization is not violating any software license agreements. Also, it can save your organization money: Just because there are 100 nodes on your network does not mean that all 100 users need to run a given application. A 25-user license of Microsoft Excel, for example, might be sufficient. SEAM and other metering products allow you to monitor software usage and use that information to determine the optimum



STAY WITH THE GROUP: SEAM lets you assign individual and group rights to applications.

number of licenses you should purchase for each application.

Unlike the software-metering utilities in other network-management packages, such as McAfee Associates' Brightworks (\$1,499 for 100 users; see the review in this issue) and Symantec's Norton Administrator for Networks (\$5,166 for 100 users), SEAM allows software license sharing across multiple servers. This means that a single copy of Saber LAN Workstation can monitor license informa-

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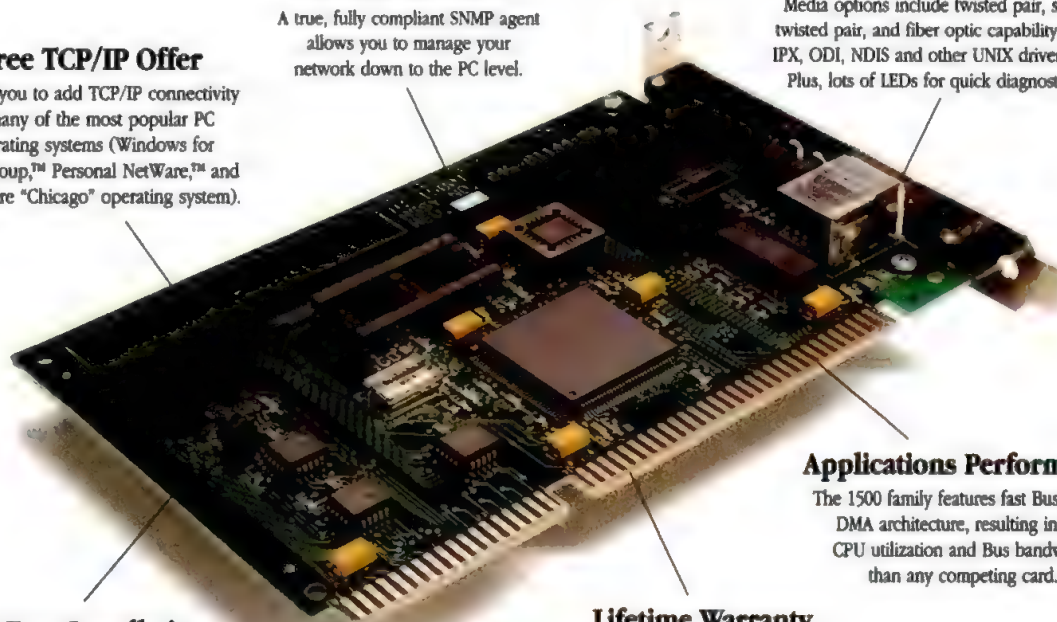
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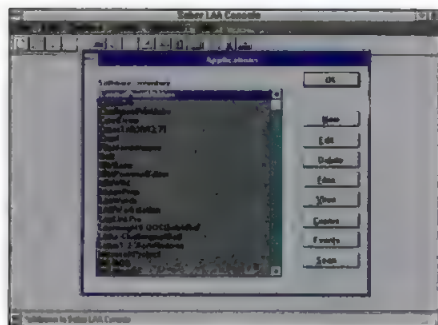
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EVEN THE GAMES: Saber LAN Workstation can meter almost any software—even golf games.

tion by polling from SEAM NLMs on every server on your enterprise network. Both Brightworks and The Norton Administrator for Networks only meter software usage on a single-server basis, so you would need to run the complete package of either one on *each* server in the enterprise.

SEAM also meters software on client PCs, although it requires a TSR on the client to do so. TSRs tie up some client memory, but the only utilities currently

available for metering client applications all use them. While the 22K TSR is fairly large, it automatically loads into upper memory if possible. The Norton Administrator for Networks also meters client applications, while Brightworks does not. One benefit of the TSR is that SEAM can automatically log a user off the network if the TSR is not resident in that user's memory, preventing unauthorized access to licensed applications—even if they reside on the client's hard disk.

SEAM places users in a queue if all of the software licenses for a particular program are in use. The queue notifies you when a license becomes available. We were also able to view the list of users in the queue as well as the individual users that were using the available software licenses. SEAM also borrows available licenses from other servers running the same application.

You can also set up individual and group rights to applications. On our tests, we were able to restrict access to certain

applications based on group, user, or department name. This is a great feature if you want to track software usage for departmental billing. SEAM provides you with a status report on software usage for all of your applications and network users.

While SEAM is easy to set up and use, Saber LAN Workstation can take several hours to install. Saber LAN Workstation is a powerful set of network utilities, but that power comes at the price of labor. We were familiar with Saber LAN Workstation, and we still needed almost 4 hours to install the product before we could even set up SEAM.

SEAM is an excellent tool for monitoring software usage on large networks and is the only product that monitors software license usage across an entire enterprise.

► **Saber Enterprise Applications Manager.** List price: \$695 per server. Saber Software Corp., 5944 Luther Ln., #1007, Dallas, TX 75225; 800-338-8754; fax, 214-361-1882.

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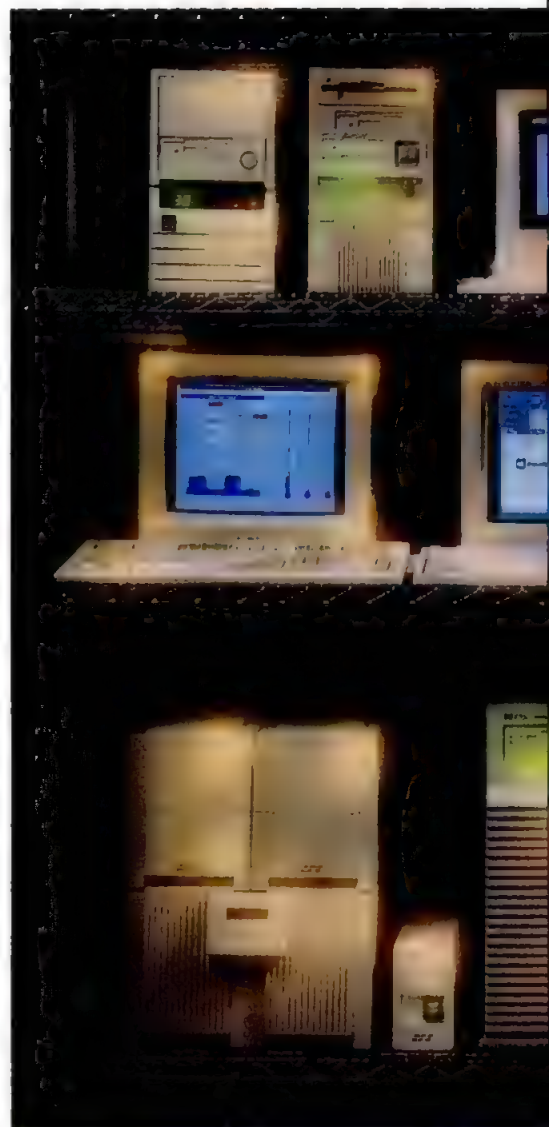
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► FILE SYNCHRONIZATION

LinkPro Helps Keep Your Files in Sync

BY STEVE RIGNEY

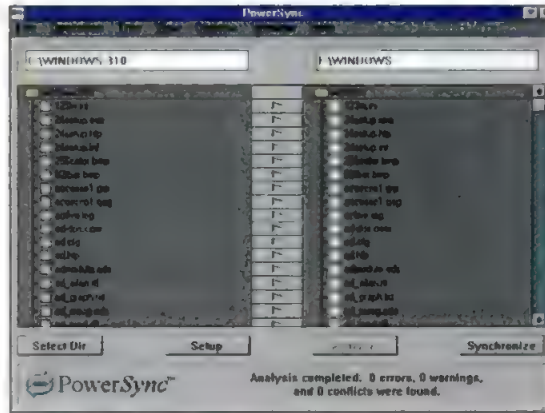
LinkPro's PowerSync 1.10 (\$89.95) gives mobile and peer-to-peer LAN users a much-needed tool: An ideal way to synchronize files between two PCs over serial connections and a peer-to-peer network. PowerSync can also synchronize files between client PCs and network file servers, but Traveling Software's LapLink V is better suited for those environments.

While file synchronization utilities are not new to the market, they are becoming increasingly important because of the skyrocketing popularity of mobile computing. With so many users taking files on the road, it's imperative to make sure that the version of a file on the network is the most current. PowerSync allows you to copy the most current version of a file to the network file server or any other mapped network or serial-attached drive. Less sophisticated products, like Protec's ByteNet, also facilitate copying from one PC to another, but they are only file-transfer utilities and cannot match files based on time, date, or other criteria.

COMPETING WITH THE STANDARD

PowerSync competes most directly with LapLink V. As its previous versions have been for the past several years, LapLink V is the de facto standard for the file-synchronization chores of mobile users. LapLink V is better suited to client/server environments because it can synchronize files between clients; the only caveat is that each end of a LapLink V connection must be running the software.

Conversely, PowerSync is better suited to peer-to-peer LANs because it does not require a copy of the software on each PC, but it cannot synchronize files between individual clients on a client/server network. Both products are equally effective at synchronizing files over serial links, although PowerSync



SIDE BY SIDE: PowerSync's easy-to-use menu system lets you compare and synchronize files on two network drives.

requires MS-DOS 6.x or a third-party remote-access utility to do so.

IDEAL FOR PEER-TO-PEER

PowerSync is most effective on a peer-to-peer LAN because it copies files between mapped network drives: In peer-to-peer LANs, each client's local hard disk can be made available as a network drive, so PowerSync allows you to match versions of files from one user's PC to another, even if the destination PC is not running PowerSync. For example, one user's local drive could be mapped as drive D: to another user. PowerSync does not allow you to synchronize files between individual clients on a client/server network, like NetWare, because the only drives that are mapped are those on the servers. LapLink V does not suffer from this limitation and is therefore more flexible, but it does require multiple copies of the software to work. In a peer-to-peer environment, where users are often already sharing each other's drives and resources may be scarce, loading even a small application like LapLink V (which requires 512K of disk space) on everyone's PC may be an unacceptable scenario.

Both PowerSync and LapLink V support synchronization over modem and direct serial cable connections. While LapLink includes software to support ser-

ial communications, PowerSync does not. Instead, it relies on the Interlink utility included with Microsoft DOS 6.x to establish the connection and map the drives. (Interlink redirects data bound for a local hard disk over the serial cable to another

PC.) Users that are not running DOS 6.x can use a third-party remote-access program to establish the serial connection. LapLink V includes a universal cable for connecting two PCs using either a serial or a parallel cable connection; PowerSync does not include a cable.

PowerSync allows you to synchronize files based on several different criteria, including date and time, file extensions (such as .EXE or .XLS), and individual files manually selected by the user. The program provides an optional

automatic synchronization utility that will compare and update your files every time you start your PC or log in to the network. Alternatively, you can use the built-in Analyze utility to view the differences between files or disk drives on a menu screen, then manually select the files you want to synchronize.

For our tests, we connected a laptop and a desktop PC that were both running Microsoft Windows for Workgroups 3.11 on a NetWare 3.11 network. We used PowerSync to synchronize a series of meetings and appointments we created using Microsoft Schedule+ on the laptop with the main Schedule+ data files on the desktop PC. We also used PowerSync to analyze and synchronize the same information between two remote PCs that dialed into the LAN via remote-node connections.

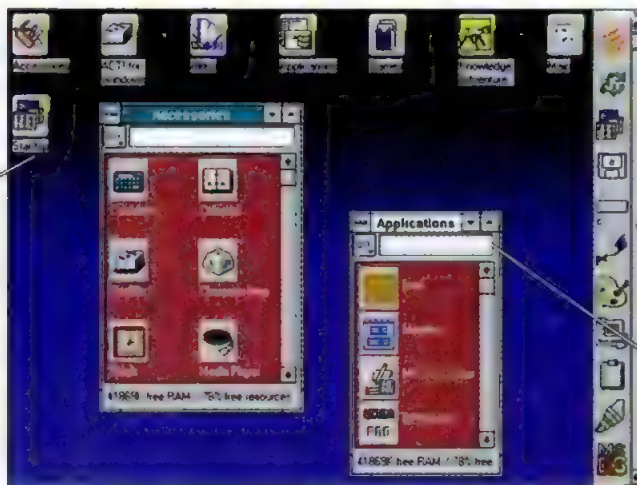
PowerSync is a useful tool primarily for peer-to-peer users because it does not require that both sides of a connection run the software. However, LapLink V offers more flexibility in client/server environments by allowing you to synchronize data between any two PCs running LapLink.

► **PowerSync, Version 1.10.** List price: \$89.95. LinkPro Inc., Box 6044, Irvine, CA 92716; 800-449-7962; fax, 714-854-3312.

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CIRCLE 854 ON READER SERVICE CARD

News of announced network products and upgrades

By Vicki B. Jacobson

NEW

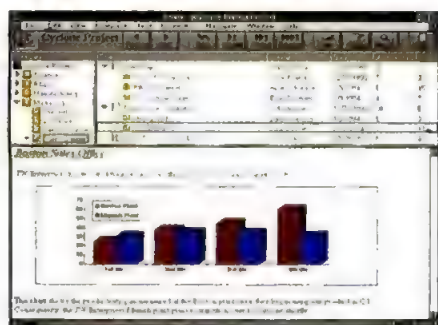
Collabra Offers Computer Collaboration

Collabra Software is moving meetings from the conference room to the computer. With Collabra Share, you can hold a discussion over the network at the discretion (and convenience) of each of the participants. Much like they would in using a forum on an on-line service, users can organize, discuss, and distribute information using an e-mail system and existing applications.

Collabra Share works within the user's existing network; it can be loaded into a company's central file server or peer-to-peer network. Because it works with e-mail, users can participate in a forum using their own e-mail system. Collabra Share is compatible with popular mail systems such as Lotus cc:Mail and Microsoft Mail, as well as Digital Equipment Corp.'s All-In-One, IBM's PROFS, and the Internet's SMTP (Simple Mail

Transport Protocol) using mail gateway.

Members of the electronic discussion can contribute, respond, query, and retrieve information over their Microsoft LAN Manager, NetWare, VINES, WfWG, and Windows NT networks. Collabra Share works with all kinds of data, including text, numbers, graphics, audio, video, and images. Agents are available that provide additional information to users of the forums. These agents can collect information from electronic news services, as well as CompuServe, Internet News, and Lotus Notes.



COLLABORATE: Collabra Share brings discussions to the computer.

► **Collabra Share.** List price: 10-user license, \$699.50. Collabra Software Inc., 1091 N. Shoreline Blvd., Mountain View, CA 94043; 800-474-7427, 415-940-6400; fax, 415-940-6440. Circle 958 on reader service card

IMPROVED

NetEdge Lets You Play Musical Chairs

NetEdge Systems' router software ATM Connect now lets you create virtual LANs within your network. Version 1.1, designed for the ATM Connect router, is the first package that allows you to implement virtual network routing in your Ethernet, Token-Ring, FDDI, or ATM LAN.

Virtual networks, defined through software, are workgroups made up of users anywhere on an enterprise network. They rescue network managers from the constant need to change physical connections and allows users who change location to retain their network address.

Other enhancements include a management information base and support for the ATM security protocol.

► **ATM Connect, Version 1.1.** List price: Free to existing ATM Connect customers; bundled with ATM Connect routers. NetEdge Systems Inc., Box 14993, Research Triangle Park, NC 27709-4993; 800-638-3343.

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HOT PROSPECT



Switches Get Racked And Stacked

The first stackable switch, the Kalpana EtherSwitch EPS-2015 RS, cuts the price of Ethernet switching while boosting throughput.

Kalpana's new switch is stackable so that it conserves space. The EPS-2015 RS also provides support for full-duplex Ethernet for half the cost of the EtherSwitch EPS-1500 (Kalpana's first full-duplex Ethernet switch).

The switch can increase throughput to both hubs and servers, creating 15 20-Mbps connections. These links provide two-way transmission: one 10-Mbps path for transmitting and one 10-Mbps path for receiving.

The EPS-2015 RS is available in a standard version (with support for SNMP, the Spanning Tree protocol, and upgrades via downloadable code) and an enhanced version (with those features as well as the full-duplex support and address filtering). Both versions feature 15 switched 10BaseT ports.

► **EtherSwitch EPS-2015 RS.** List price: \$7,500 to \$8,500. Kalpana Inc., 1154 E. Arques Ave., Sunnyvale, CA 94086; 800-488-0775, 408-749-1600; fax, 408-749-1690.

Circle 951 on reader service card

BRIEFS

HUBS

Xyplex Inc. recognizes the fact that ISDN is becoming more widely available and standardized, so it's offering a selection of on-board ISDN modules (\$8,995 to \$11,995) for its Network 9000 Routing Hub. In order to accommodate bandwidth-intensive applications such as videoconferencing, these modules will host direct connections to T1/E1, fractional T1/E1, Switched 56, and ISDN Primary and Basic Rate services. 508-264-9900.

Fibronics International Inc. introduced two new stackable managed hubs. The 24-port FR9230 Token-Ring Management Unit (\$3,290) can be managed via Fibronics' InterView/Win Network Management System (\$1,190). The 16-port FER2061 Stackable Ethernet Hub (\$1,200) is designed to work with FDDI backbone and collapsed backbone (in which LANs are tied to a central multiprotocol router) environments. 617-826-0099.

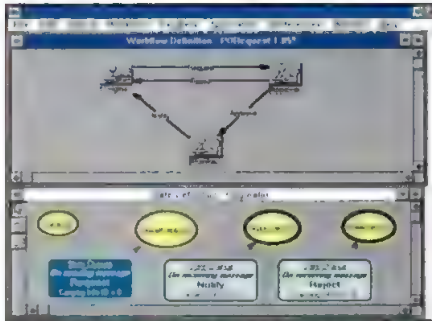
ADAPTERS

Madge Networks Inc.'s new Smart 16/4 Fiber AT Ringnode adapter offers more than its predecessor (the Smart 16/4 AT Ringnode), including additional security features and support for fiber-optic cable. The Token-Ring card (\$955) features support for the IEEE-802.5j standard for transmissions over fiber. 800-876-2343.

CNet Technology Inc. released three PCMCIA Type I adapters that it claims offer low power consumption and high throughput. The CN10BT adapter (\$229) offers a 10BaseT connection, the CN10B2 (\$229) offers a coaxial connection, and the CN10BC (\$299) provides both types of connections. 800-486-2638.

IMPROVED

Enhanced Workgroup Tools Come Within Reach



WORK AND MORE WORK: Reach's WorkMAN decreases development time.

Reach Software Corp. promises that the latest release of its workflow management system WorkMAN will decrease the time you need to spend on development and management. Version 1.1 features additional e-mail support as well as enhanced tools for organizing, routing, and tracking information across an enterprise.

WorkMAN comprises two parts: the WorkMAN Platform, which includes the WorkMAN Services Engine and desktop tools, and WorkMAP Professional Tools, a set of graphical development tools.

WorkMAN includes support for Lotus cc:Mail. (Support for Lotus Notes was included in its previous release.) Other new features include integrated status-tracking capabilities for all applications, a routing slip application, a utility for managing client installation configuration, and a new GUI.

► **WorkMAN, Version 1.1.** List price: 5-user license, \$2,495. **WorkMAP Professional Tools.** List price: \$3,995. Reach Software Corp., 872 Hermosa Dr., Sunnyvale, CA 94086; 800-624-5356, 408-733-8685.

Circle 955 on reader service card

IMPROVED

3Com Brings WAN Access Closer to Home

To drive down the expense of WAN links to remote sites, **3Com Corp.** has announced enhancements to its NETBuilder internetworking software and hardware. Improved dial-up features and frame-relay support are integrated into its protocol software NETBuilder Basic and the NETBuilder II software. A new hardware module is available for the NETBuilder II router. The announcement follows on the heels of the company's announcement of its new NETBuilder Remote Office platform.

The NETBuilder software uses IPXWAN (Internetwork Packet Exchange for WAN environments) in order to work with Novell's MultiProtocol Router Plus 2.x software as well as other routers. A four-tier data-prioritization scheme is also being implemented. Users can prioritize traffic with ratings of urgent, high, medium, and low. A new 3-port V.35 module for the NETBuilder II router cuts costs by increasing port density (from 8 to 24) and supporting a speed of 2.048 Mbps for all three ports.

► **NETBuilder Basic, Version 7.0.** List price: \$350. **NETBuilder II, Version 7.0.** List price: \$2,000. **V.35 module.** List price: \$3,295. 3Com Corp., 5400 Bayfront Plaza, Box 58145, Santa Clara, CA 95052-8145; 408-764-5000.

Circle 954 on reader service card

NEW

Matrox Simplifies the Switch

Matrox Electronic Systems announced a 16-port board that can boost your network throughput by turning your PC into an Ethernet switch. The NetSwitch/16 increases your system's throughput, providing each of its ports with an additional 10 Mbps. The board enables users to run multimedia applications on Ethernet by giving priority handling to audio and video packets.

► **NetSwitch/16.** List price: \$3,200. Matrox Electronic Systems Ltd., 1055 St. Regis Blvd., Dorval, Quebec, Canada H9P 2T4; 800-361-4903, 514-685-2630.

Circle 956 on reader service card

NEW

HP Lowers the Cost of Linking LANs

Linking a corporate network to its branch offices is no small expense. **Hewlett-Packard** aims to help reduce that expense with its new \$7,995 AdvanceStack Router 650 and with 20-percent price reductions on five of its branch office routers. For under \$12,000, users can purchase an AdvanceStack with a four-port Ethernet card. The router offers two features that the vendor claims gives it top performance: a distributed processing architecture and advanced memory management. The router offers concurrent multi-protocol bridging and routing for Ethernet, FDDI, Token-Ring, and 100VG-AnyLAN (an emerging standard for transmitting Ethernet and Token-Ring at 100 Mbps) networks. WAN support includes dial-up, frame relay, ISDN, leased-line, SMDS, and X.25.

► **HP AdvanceStack Router 650.** List price: \$7,995; 4-port Ethernet interface card, \$3,995. Hewlett-Packard Co., Direct Marketing Organization, Box 58059, MS511L-SJ, Santa Clara, CA 95051-8059; 800-533-1333; fax, 800-333-1917.

Circle 957 on reader service card

NEW

Shiva Remote Server Offers Integrated Modems

Shiva Corp. announced the LanRover/Plus, a remote-access server that offers integrated high-speed modems for easier installation and maintenance, ISDN support for high-speed communication, and a choice of management options. The server has a modular architecture, giving users a choice: integrated V.32bis modems or high-speed asynchronous serial ports. It has eight slots for either



FAST TRACK: LanRover/Plus supports integrated modems and ISDN.

four or eight modem or asynchronous serial cards. With a choice of protocols such as IEEE 802.2/LLC, IP, IPX, or NetBEUI, users can dial into their LAN Manager, NetWare, TCP/IP, WfWg and Windows NT LANs. Management is provided either locally or remotely from a PC running Shiva Net Manager or an SNMP agent.

► **LanRover/Plus.** List price: 4-port asynchronous serial version, \$4,299; 8-port asynchronous serial version, \$4,999; 4 V.32bis modems, \$6,499; 8 V.32bis modems, \$8,499. Shiva Corp., Northwest Park, 63 Third Ave., Burlington, MA 01803; 800-458-3550.

Circle 952 on reader service card

NEW

Cabletron's Hubs Go Remote

Cabletron Systems brings remote access to its hubs with the 16-port ModMim module. The ModMim, a collaboration between Cabletron and Xylogics, can integrate up to 12 V.32bis modems for dial-in/dial-out users. The module, designed for Cabletron's MMAC intelligent hubs, eliminates some wiring hassles by providing a direct connection for terminals and serial devices to Ethernet, Token-Ring, and FDDI networks.

► **ModMim.** List price: \$1,495. Cabletron Systems Inc., 35 Industrial Way, Rochester, NH 03867-0505; 603-332-9400.

Circle 959 on reader service card

BRIEFS

MODEMS

U.S. Robotics cut prices on its WorldPort PCMCIA modems by up to 40 percent. The WorldPort 14400 Fax PCMCIA now lists for \$339 (down from \$399), and the WorldPort Dual Standard Fax PCMCIA is \$595 (down from \$995). The PCMCIA modem features V.32bis support; V.42/MNP 2, 3, and 4 error control; and V.42bis/MNP 5 data compression. In addition to these features, the Dual Standard modem includes support for HST, a modem protocol that includes error control and compression for 16,800-bps data transmission. 708-982-5010.

Multi-Tech Systems Inc. boosted the capabilities of its V.32terbo MultiModemPCS voice/data modem (\$949) by adding the TALKShow document-sharing and videoconferencing software from Future Labs. Users can make changes interactive to a document that is simultaneously displayed on both PCs. Using the modem, they can then verbally discuss these changes over the same phone line. 800-328-9717.

PRINT SERVERS

Digital Products Inc. enhanced its line of VINES print servers, providing multiprotocol support for VINES, Unix EtherTalk, and NetWare environments. The three new print servers are NETPrint/104 (\$1,195), NETPrint/200 (\$1,595), and JETXPrint/104 (\$995). 800-243-2333.

Xircom Inc.'s Pocket Ethernet Print Server Iips (\$599) offers support for multiple network operating systems and protocols. It now supports LAN Server, Microsoft LAN Manager, and Windows NT in addition to NetWare. 800-438-4526.

When a few engineers at Microsoft set out to write Windows NT, they sat down with many cups of coffee, and computers built around the MIPS® R4400™ RISC microprocessor.

(No wonder: the NEC V_R4400™ MIPS processor is at the heart of some of the most powerful computers in the world.)

During the next few years, they worked long and hard, missing quite a few dinners with their families and untold televised sporting events.

Today, Windows NT makes it possible for companies to run their enterprise software on a whole new class of dependable, affordable machines. Like the NEC Express RISCserver™, direct descendant of the machines used to write NT itself. And it gives software developers, designers and engineers access to remarkable new tools like the NEC Image™ RISCstation™.

In short, a few engineers sat down. And the entire computing world leaped.

The only Windows NT-specific systems in the industry: NEC MIPS RISC Systems™

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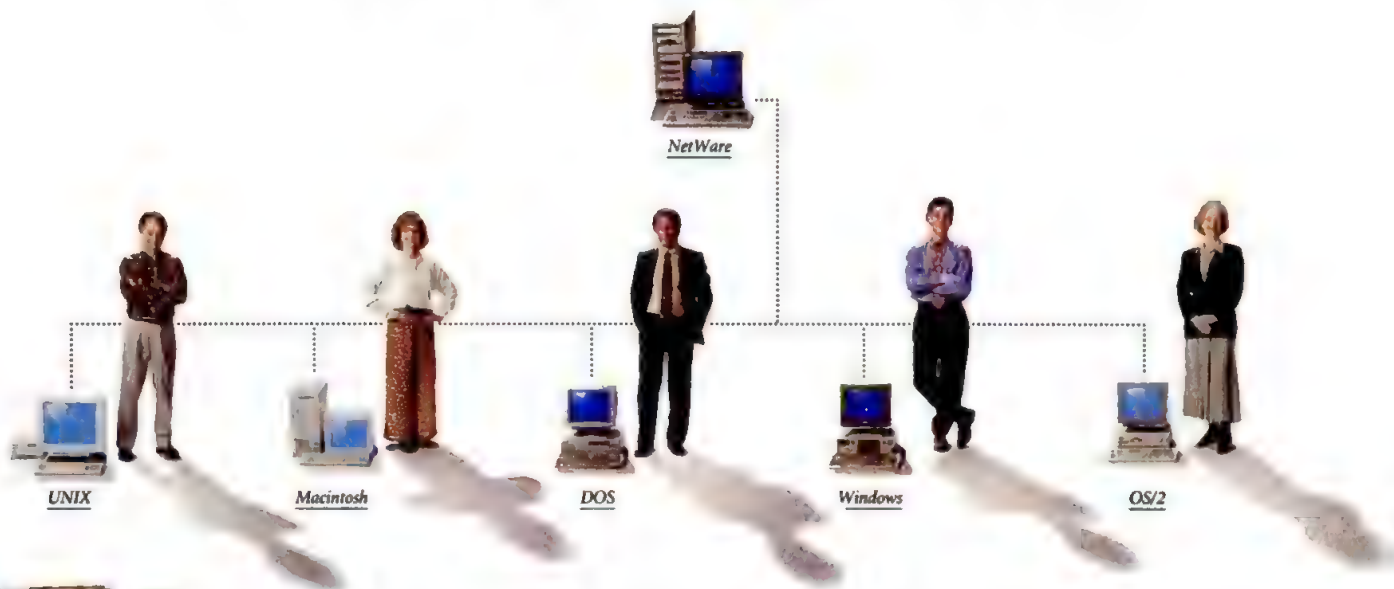
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A river of coffee. A raft

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CIRCLE 868 ON READER SERVICE CARD

Different Paths to Voice/Data Integration

New technologies promise to make combining voice and data more affordable.

By M. David Stone

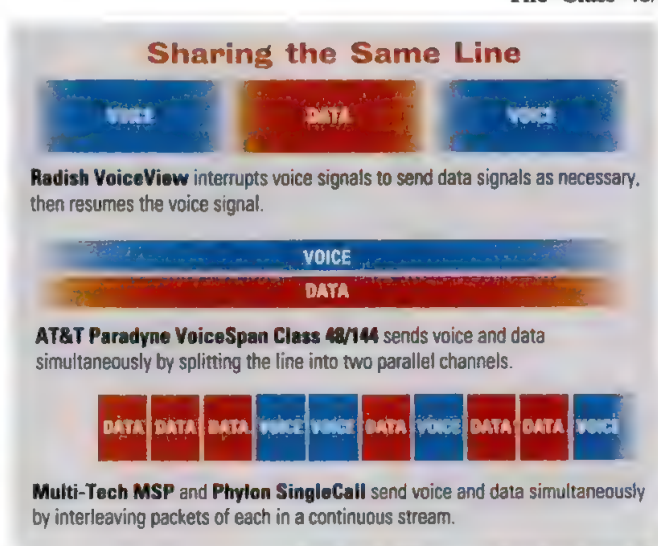
The value of sending voice and data during a single phone call is easy to see. Until recently, however, the only way to do it was via an all-digital service like ISDN, which is still too expensive for most offices. Several vendors have developed ways to accomplish this task on less-expensive analog lines.

The VoiceView protocol from Radish Communications Systems lets you alternate between sending voice and sending data. AT&T Paradyne's VoiceSpan splits the line into two channels that support voice and data simultaneously. The Multi-Tech Supervisory Protocol (MSP) from Multi-Tech Systems also supports both simultaneously by automatically adjusting the ratio of voice to data as needed. Phylon's recently announced SingleCall utilizes the same technique as MSP.

ONE AT A TIME

Radish's VoiceView is the only one that doesn't support simultaneous voice and data. It promises, however, to be the most widely available in the near future because of its low licensing fee.

VoiceView utilizes software to switch the line between voice mode and data mode. When you're talking, VoiceView sends voice only, avoiding the degradation of voice quality caused by sending voice and data simultaneously. When you need to send data, VoiceView stops sending voice, activates the modem, sends the data, then switches back to voice mode. VoiceView will work with any modem



protocol, but it is optimized for 9,600 bps (V.29 or V.32).

VoiceView support should add about a dollar to manufacturing costs. However, it isn't suitable for applications such as computer whiteboards that are only feasible if you can send simultaneous voice and data. It also requires specialized software or manually entered AT commands to switch between data and voice. The other technologies will use standard AT commands so they will be better integrated with most communications software packages.

► **Radish Communications Systems Inc.**, P.O. Box 20220, Boulder, CO 80308-3220; 303-443-2237; fax, 303-443-1659.

THE TWO-CHANNEL APPROACH

AT&T Paradyne's VoiceSpan splits communications into two parallel channels: one each for voice and data. Because both share the same line, voice quality will suf-

fer. Unlike VoiceView, VoiceSpan defines a new modulation scheme for translating digital information into analog signals. Higher-speed implementations of VoiceSpan will be possible, just as 14.4-Kbps speeds (V.32bis) grew out of a 9,600 bps (V.32) modulation scheme.

The Class 48/144 implementation of

VoiceSpan is available on AT&T's DataPort 2001 modem and offers maximum data rates of 4,800 bps on voice/data connections and 14.4 Kbps on data-only calls. By the time you read this, the modem should be upgraded to support a compression technique called Data-Burst to boost data throughput on a voice/data line to an average of 11,000 bps.

VoiceSpan will cost more than VoiceView—probably \$30 to \$50 more per modem.

► **AT&T Paradyne**, 8545 126th Ave. North, Largo, FL 34649; 800-554-4996, 813-530-2000; fax, 813-530-2103.

DYNAMIC LINE ADJUSTMENT

MSP and SingleCall, though incompatible, both send discrete packets of voice and data over a continuous connection. In effect, they establish a two-node packet-switching network, dynamically adjusting the ratio of voice to data. The two use different voice-compression algorithms.

Multi-Tech expects MSP to add \$25 to \$30 to the price of a modem. Phylon expects SingleCall to add \$20 or less.

► **Multi-Tech Systems Inc.**, 2205 Woodale Dr., Mounds View, MN; 800-328-9717; fax, 612-785-9874.

► **Phylon Inc.**, 4027 Clipper Ct., Fremont, CA 94538; 510-656-2606.

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Love Misguided: The Truth About ATM

If this year's Interop+NetWorld trade show is like last year's, there's one three-letter acronym that will be on everybody's lips: ATM. Yet, as the industry falls in and out of love with asynchronous transfer mode, one thing remains consistent: the press's misguided focus on ATM hardware.

The gigabit speeds and flexible network architecture that ATM hardware affords may make it the future network of choice for telephone carriers, cable TV operators, and hub and router vendors, but will hardly differentiate the individual ATM products.

The real distinction among the ATM products lies in the services they offer. These individual services are LAN-to-LAN pass-through, LAN emulation, IP over ATM, and an ATM API (application programming interface). Let's look at each service.

LAN-TO-LAN PASS-THROUGH

The first and least valuable service for ATM switches or ATM-enabled hubs is LAN-to-LAN pass-through. It extends an Ethernet, Token-Ring, or FDDI LAN across a long distance, from across a campus network to across the country. Pass-through encapsulates packets from such LANs into ATM cells. In effect, this service leverages the existing LAN infrastructure cost, since there is no need to purchase ATM adapters on the desktop. But LAN-to-LAN service will not convert between networks, so you can't have ten Ethernet segments on one end connecting to a single FDDI connection on another end—a typical scenario for a high-performance work-group sharing a file server.

LAN EMULATION

The next ATM LAN service is LAN emulation. LAN emulation attempts to make an ATM network look and act like a normal LAN by supporting broadcast services (where data packets are sent to a group of users) and allowing network adapters to operate over an ATM network. This means that in theory, all existing applications and network operating systems will work over an ATM network in LAN emulation mode. LAN emulation offers more than a high-speed pipe in which to funnel packets, between networks. LAN emulation software interacts with the packets setting up connections and tearing them down. The major drawbacks of LAN emulation remain



By Nick
Lippis

unsettled standards and decreasing hopes of interoperability among ATM switches.

IP OVER ATM

The third service is IP over ATM. This service taps key features and functions of ATM networks by allowing TCP/IP to interact directly with the ATM network. For this service, the ATM network will set up and tear down calls between TCP/IP desktops. The ATM network will negotiate with desktops to improve services (such as priority of service and amount of bandwidth)

for different applications (such as traditional file access and transfer and desktop video.)

There are two problems with this service. Each PC must be equipped with an expensive ATM adapter, and the standards are still not in place.

ATM API

The least implemented yet potentially most powerful service is the ATM API. An ATM API will allow applications to make more efficient use of the ATM network. The API runs on clients and servers, allowing developers to link their code directly to the ATM network, bypassing network protocols like IPX and IP. This opens a whole new world of network-based multimedia applications bounded only by the programmers' imagination. Programmers would write to a basic set of verbs, which would open a connection, close a connection, and negotiate for bandwidth between two desktops. ATM APIs are being developed by Apple, Novell, and Fore Systems.

The drawback of this service is its unavailability: Fore Systems is the only vendor shipping an ATM API, an ATM desktop adapter is required along with it, and there are no standards in place to define the basic verb structure of the API.

These features will make switches more powerful. So when evaluating ATM switches, look past hardware. It is clearly the commodity in this market, and high-speed interfaces will be the norm. Look hard at network software, which will deliver new services to the desktop in need of speed.



*The real distinction among
the ATM products lies in the
services they offer.*

NICK LIPPIS is a contributing editor of *PC Magazine* and president of Strategic Networks Consulting, a consultancy specializing in enterprise networking. He is also publisher of *The Internetwork Advisor*, a monthly newsletter.



If you want to improve network productivity, here's a mouthwatering proposition.

Twenty-five percent off the price of all NetWare 3 and 4 upgrades is definitely a tempting offer. But saving money is just the appetizer.

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Upgrading is both quick and easy, and can bring significant productivity benefits to your entire company.

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move to the latest version of NetWare 3, the industry's most popular network operating system. Or you may wish to take advantage of Novell's most powerful and easy-to-administer operating system, NetWare 4.

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UPGRADE

Homage to the Dead...Router?

With a deep bow toward the inspiration of Lewis Grizzard, I wanted us to name this column "The Router Vendors Dropped the Oars, and They're Heading for the Falls!" but that title won't fit in the space above. However, the thought fits just fine.

Anyone considering a large investment in routers needs to study the market currents before jumping in. The water is moving fast in the router industry, new low-end markets are emerging, and the traditional leaders—which have focused on selling expensive, proprietary boxes at the high end—have stopped paddling.

Since most routers are proprietary hardware devices, there are many points to consider before committing yourself to using one—including the question of whether or not you need a router at all. And here's why:

First, most routers are actually software, so you'll need to consider the hardware issues involved: Are you sure you want to purchase the expensive equipment that houses a router? The fancy cabinets with pretty logos that the software is sold in contain fast computers, but that's all they are. We've got plenty of those at bargain prices.

Second, the business of routing protocols is now getting easier: Do you want to pay for the research and development that was needed when vendors had to figure out just how to route protocols?

Third, fairly new technologies like the unsung frame relay and the overly famous ATM don't use routers: Are you sure you really need one? Anyone looking at buying routers for a multipoint network should consider using a frame-relay service offered by a telephone carrier instead. Frame relay will lead to ATM services that are homogeneous from desktop to WAN.

Look, the folks at 3Com are already powering away with Boundary Routing—a new technology that simplifies router setup and operation. (See the review of dial-up routers in our May 31 issue.) New companies such as NEC America and Rockwell International are leading the pack in the new low-end, dial-up routers while vendors of traditional routers snooze.

When you jump in the boat with a router vendor and paddle away from shore, you're stuck there: On the phone line, routers are proprietary. So before you leave the dock, study the current and the falls beyond, because there are other ways to travel.



Frank Derfler:
*Are you sure
you want to purchase
the expensive
equipment that
houses a router?*

Boy, Frank, that was *insightful*. You almost caught me there. You point to the potential of dial-up routers. Nobody can argue with that one. But then you talk about 3Com as if it's one of those nouvelle companies that haven't touched routers before. Nothing could be further from the truth.

Software routers and low-end dial-up routers are great, Frank, but let's not forget where a hardware router really shines: as the center of an enterprise network.

Each of the market leaders—Cisco, Wellfleet, and 3Com—has a great range of products for the small workgroup through the very complex internetwork. Each has developed the expertise necessary to make routers for mission-critical environments. That experience—and their breadth of routing products—leaves them with a critical competitive advantage.



David Greenfield:
*Fault-tolerance and
performance are key
here. Are you really
willing to bet on a
PC's reliability?*

Not even the strongest of the software routers, Novell's MPR, is suited to serve as the linchpin of a corporate network. While the MPR supports many of the key protocols—like IP and IPX, to name two—it lacks supports for other key protocols like SNA.

Fault-tolerance and performance are key here. You can't possibly afford to have your backbone router fail. Are you really willing to bet on a PC's reliability?

Today's hardware-based routers, by contrast, offer powerful RISC processors on high-speed backplanes for maximum performance. Redundant power supplies and other features have been added to ensure high reliability.

Let's be clear for our readers, Frank. There is a real place for software-based routers. They give you a simple yet potentially inexpensive way to offer multiprotocol routing to the workgroup. They are particularly helpful in small companies.

But if you are looking to connect many workgroups and you need multiprotocol routing, then purchase a router from the vendor you use for the rest of your equipment. Frank, 3Com's Boundary Routing is only one solution for simplifying router configurations: Cisco and Wellfleet have their own solutions.

As long as there are legacy LANs, we need a way to connect them into larger networks. Routers, in whatever form, are that solution. And when you need high performance and high reliability, I say stick with the products that make sense: today's routing platforms.

KING AMONG PEERS

POWERLan 3.0: The Most POWERful Peer-to-Peer LAN Operating System

Click a mouse four times and key in your name. That's all it takes to install POWERLan. But the sleek, animated interface is just the beginning.

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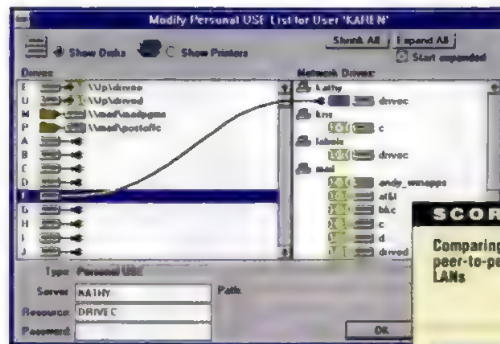
POWERLan's multi-tasking, dedicated server provides the capacity and horsepower for your performance-critical applications.

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Built to Microsoft/IBM standards, POWERLan speaks the same protocols as networks such as WFW, NT, and IBM LAN Server—complementing these environments where needed.

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PC Week
February 7, 1994

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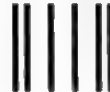
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User-to-User

BY NEIL J. RUBENKING

Removing Windows Apps From the PATH

Windows applications don't normally need to be on your path, but many install programs update the PATH statement in AUTOEXEC.BAT anyway. Often the only reason for having the application's directory on the path is to locate the main executable module. In that case, you can accomplish the same thing by specifying the full pathname on the Command Line text box in the Program Item Properties dialog box. Central Point Software's new PC Tools for Windows is an excellent example: It installs with the full pathname but *still* adds its directory to the PATH statement.

There are some Windows applications, such as Grammatik 5 for Windows, that

do need to be on the path because of the method used to invoke them from another application. To check whether it's necessary to list a particular Windows application's directory in the PATH statement, first make certain that the application works as installed. Check that the full path is specified in the Command Line text box by selecting the application's icon in Program Manager, and then choosing Properties from the File menu. Now remove the application's directory from the PATH statement in AUTOEXEC.BAT. Exit Windows, reboot, restart Windows, and try the application again. If it works, you're in business. If not, put the directory back in the PATH statement.

The point of this exercise is to shorten your path. A shorter PATH makes your AUTOEXEC.BAT easier to read, saves a small amount of memory, and improves performance slightly. More important, it leaves room for other applications that need to be on the path.

Jim Gunn
Salt Lake City, Utah

► **PC MAGAZINE:** The more directories on your path, the longer it takes DOS to search the path. If you mistype a command at the DOS prompt, DOS has to

search every directory on the path before responding, "Bad command or file name." On a slow machine, the delay can be noticeable.

Like every DOS command line, the PATH statement is limited to 127 characters. That means the path itself can't be longer than 122 characters: 127 minus the 5 characters PATH=. It's possible for a PATH= line in a batch file to be longer, but characters after the 127th will simply be ignored. Thus, if an install program blindly adds a new directory to an already long PATH statement, the resulting path may contain only part of the new directory. Worse yet, if an install program inserts its new directory at the *beginning* of a long PATH, directories that were already on the path may be pushed off. It's definitely in your best interest to keep the path as short as possible.

Making DOS Help More Helpful

In DOS 6.0, more than half the reference material previously found in *MS-DOS 5.0 User's Guide and Reference* has been replaced by DOS Help, an on-line reference to DOS commands. On-line is a bit of a misnomer, though, as HELP is a separate program and isn't available from within other DOS programs. I discovered this as I was editing my AUTOEXEC and DOSKEY-macro batch files using the DOS Editor. I found I had no way to look up the syntax for DOS commands and DOSKEY macros without exiting DOS Editor and starting DOS Help (*MS-DOS 6.0 User's Guide* does not have this information).

A simple way to have near-on-line access to DOS Help while working in the DOS Editor or any other program is to create a program item in DOS Shell that

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```

Program Title . . . . [MS-DOS Help]
Commands . . . . . [C:\DOS\HELP]
Startup Directory . . [C:\DOS]
Application Shortcut Key [ALT+H]
[ ] Pause after exit Password . . [ ]

```

Figure 1: Create an entry for MS-DOS Help in DOS Shell by filling in the Program Item Properties dialog box as shown.

opens DOS Help. Then with Task Switcher activated and DOS Help added to the Active List, you can move back and forth between Editor and Help, for example. Since Help remains active, you can locate whatever information you need, scroll through Help screens as necessary, and swap back to the Editor without losing your place in Help or in the file being edited.

To create the program item, start DOS Shell by entering DOSSHELL at the command prompt. Tab to or click on the Program List area of the screen. From the File menu, choose New. Choose the OK button and an Add Program dialog box will ap-

pear. Fill in the dialog box to match the one shown in Figure 1, and then choose OK. This creates a new program item titled MS-DOS Help in the Main program group.

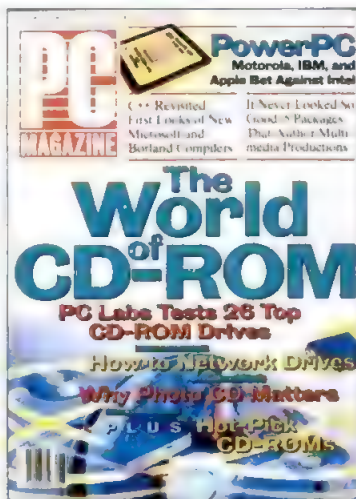
To put MS-DOS Help on-line, choose Enable Task Swapper from the Options menu, and then start MS-DOS Help from the Main program group. Return to DOS Shell by pressing Ctrl-Esc, and start Editor or any other program. Press Ctrl-Esc anytime to return to DOS Shell, or cycle through all active programs by holding down Alt and pressing Tab for each step through the active task list. You can use the application shortcut key Alt-H to go directly to MS-DOS Help.

Save your *MS-DOS 5.0 User's Guide and Reference*. Many useful topics in that guide do not appear in DOS 6.0's Help.

Zell Cantrell
Steilacoom, Washington

► **PC MAGAZINE:** I'm not a big fan of DOS Shell, but this is one case where it can really be useful. DOS 6.0's "on-line" help is *no* help when you're in the middle of editing a batch file or typing a long and complicated command. And as Mr. Cantrell says, looking up command syntax in the DOS manual is no longer an option with DOS 6.0.

If you normally use DOS Shell only for file management, you may not see the Program List window. Select Program List from the View menu to see only the Program List and Task List, or select Program/File List from the View menu to display File List and Directory Tree. Now you can proceed with the steps described above to get on-line help for DOS 6.0. Note that you can do this just as easily using Windows, DESQview, or any multi-tasking or task-swapping system. □



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Tutor

BY JEFF PROSISE

Morphing: Magic On Your PC

One of the hottest effects in computer graphics these days is *morphing*—the construction of animated sequences in which an object changes shape or transforms into a different object altogether. The term *morph* comes from the word *metamorphosis*—a change of physical form or structure. Morphing as we know it today was first seen in the 1988 movie *Willow*. It has appeared in various places since, including music videos (Michael Jackson's "Black or White"), television commercials (the Exxon commercial that depicts a moving car turning into a running tiger), and more movies (*The Abyss* and *Indiana Jones and the Last Crusade*). It was a movie, in fact, that made morphing a household word. In one of the most famous scenes ever projected onto the big screen, an amorphous blob of liquid metal shapes itself into human form, and then into the figure of actor Robert Patrick in 1991's *Terminator 2: Judgment Day*. Morphing was one of several computer-graphics technologies involved in this seemingly magical transformation.

Commercial morphs such as these are laboriously rendered on expensive graphics workstations. Animators at Industrial Light & Magic (ILM), the San Rafael, California-based company that pioneered the art of movie morphing and other computerized special effects, logged several thousand man-hours producing the effects for *Terminator 2*. Most of the work was done on multiple-processor Silicon Graphics 300-series workstations with up to four CPUs and 64 MB of RAM each, using custom software developed by ILM—not exactly

the kind of setup an average user has access to.

Thanks to a handful of enterprising software makers, however, Morphing is now within the reach of anyone who owns at least a 386-based PC. John R. Quain reviewed three PC morphing packages in "Morphing: The Latest in Special Effects Fun" (*PC Magazine*, October 26, 1993): HSC Digital Morph 1.1, Morph 1.0, and PhotoMorph 1.2. With these packages, you can create simple morphing sequences in a matter of minutes. With a little time and effort, you can create some dazzling animations in which real-life objects change shape in front of your eyes. PC morphing packages aren't yet up to reproducing the stunning graphics seen in *Terminator 2*, but they do make morphing easy. Rather than manually creating each scene, or *frame*, in an animation sequence, you provide starting and ending frames, apply a few simple constraints, and tell the morphing program how many intermediate frames to create. (Animators often call the intermediate frames *tweens*, short for *in-betweens*.) The software does the rest.

Fundamentally, morphing is a blend of two interesting but otherwise unremarkable computer-graphics techniques: *cross-dissolving* and *warping*. Understand these and it's only a short step to understanding morphing, too.

CROSS-DISSOLVING Suppose you're given two computer images of equal size, shape, and resolution, and you want to create an animated transition from one to the other. The simplest way to achieve this effect is to start with the before image and slowly fade it out while fading in the after image—a process known as *cross-dissolving*.

Computationally, the challenge is to determine RGB values for each pixel in each frame of the animation sequence. The RGB values of individual pixels in the intermediate frames are calculated by taking weighted averages of the RGB values of corresponding pixels in the starting and ending frames. Weighting is calculated as a percentage of the transformation's completeness. For example, in a frame that lies exactly halfway between the starting and ending frames, the value of an individual pixel's red component is calculated by multiplying the red component of that pixel in the starting frame by 0.5, multiplying the red component of that pixel in the ending frame by 0.5, and adding the two together.

Morphing, one of the hottest effects in computer graphics these days, allows you to create dazzling animations in which real-life objects change shape in front of your eyes.

For a frame that occurs only one-quarter of the way through the morph, the weighting factors would be 0.75 and 0.25, respectively. Do the same for the pixel's blue and green components and you have all the information you need to display that pixel in the intermediate frame. Thus, the closer an intermediate frame lies to the starting or ending

frame, the more the starting or ending frame contributes to its appearance.

Figure 1 illustrates a very simple cross-dissolve, in which a red square fades to blue in five frames. In the third frame, the square's color is a perfect blend of red and blue (magenta). In the second and fourth frames, the color leans decidedly toward red or blue. The numbers beneath the frames denote the RGB values of pixels within the square. Valid values range from 0 to 255, with higher numbers representing brighter

Cross-Dissolving



Figure 1: Cross-dissolving is accomplished by fading out the pixels of one image while fading in the pixels of another image. The numbers in circles denote the RGB values of individual pixels at various points in the transformation.

hues. Since you're calculating color values frame by frame, pixel by pixel, this technique would work equally well if the square contained pixels of different colors. It would work even if there were no visual similarity at all between the two images.

WARPING Now suppose that instead of changing the image's color, you want to change its shape—the way a fun-house mirror changes a reflected image. To do this, you need to distort the image from frame to frame, slowly migrating points in the source image to new locations in the destination image. This is known as *warping*.

One way to implement warping on a computer is to divide the image into many small polygons, like the pieces of a puzzle. Each polygon is defined by the coordinates of its vertices (the points where the sides of the polygon come together). As a polygon and its vertices move, points inside the polygon move, and the number of pixels can change, too. Algorithmically, this is accomplished by interpolating between the coordinates of the polygon's starting and ending vertices to arrive at an intermediate set of vertex coordinates. The colors inside the polygon are then resampled, which amounts to averaging all the colors in the original image that contribute to a given pixel in the current image. None of this is all that difficult to accomplish, but it can be expensive in terms of processor time, because an image may be composed of a million or more pixels.

Figure 2 illustrates—again, in a simplified way—how an image might be divided into discrete four-sided polygons and

warped using this approach. The before image depicts a simple square. In succeeding images, the polygons in and around the square are moved and reshaped so that the red pixels in the after image roughly approximate a circle. For a given polygon, the coordinates of its vertices in intermediate frames can be interpolated from the coordinates of its vertices in the starting and

ending frames. If a certain vertex moved from (10,10) in the starting frame to (20,20) in the ending frame, for example, then using a simple linear interpolation, the vertex would lie at (15,15) in a frame halfway between. By partitioning the image into more polygons, you could refine this transformation to produce an almost perfect circle.

WARPING PLUS CROSS-DISSOLVING Morphing combines warping and cross-dissolving into a single process. Typically, a morphing program lets the user select two images: a source image and a destination image. The user places control points throughout the source image, and the program duplicates them in the destination image. By repositioning the duplicated control points in the destination image, the user controls the flow of pixels during the transformation, like liquid pouring into a mold. Control points in the destination image seem to exert a physical pull on the picture, deforming it as though it were a rubber sheet. Internally, the morphing software uses the control points to divide the image into polygons.

The morphing program's job is to create frames linking the starting image to the ending image. To create a frame at,

say, 10 percent through the transformation, the software first warps the starting image 10 percent toward the ending image. Then it warps the ending image 90 percent toward the starting image. Then it does a cross-dissolve on the result. As the sequence progresses, the destination image exerts increasingly more influence over the shape and color of the composite image, and the source image exerts increasingly less. When the frames are played back in movie-like fashion, objects in the source image seem to transform magically into objects in the destination image.

The screenshots in Figure 3 show nine frames from a lemon-to-apple morph produced using North Coast Software's PhotoMorph software package. This was a fairly easy morph to produce, because the shape of a lemon isn't drastically different from that of an apple. Figure 4 shows the control points I set up to guide the transformation. Each control point in the source image has a corresponding control point in the destination image. To create the control point that lies at the top of the lemon, I clicked the left mouse button at that location in the source image. Then I dragged the corresponding control point in the destination image to the top of the apple. Next, I created the other control points on the lemon's perimeter and dragged the control points in the destination image to corresponding locations on the apple's perimeter. Once the control points were in place, PhotoMorph required just a few seconds to create a Video for Windows AVI (audio-video interleaved) file, which can be played back with PhotoMorph's AVI Player or any other AVI playback module, such as Windows' Media Player accessory.

In principle, the morphs you see in the movies are no different from this example. There's nothing especially difficult about morphing itself; the difficulty lies in creating the intermediate frames in a manner that transforms recognizable features in the original image (in this case, the lemon's basic shape) to corresponding though possibly very dif-

Warping

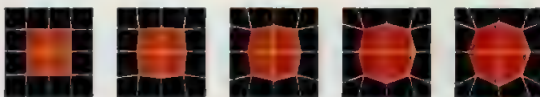


Figure 2: One way to warp an image is to divide it into polygons and transform the polygons individually. This maintains image continuity and ensures that pixels flow evenly. Pixels inside a polygon are pulled along when that polygon is moved or reshaped.

▪ NTXFORM's Displays



Figure 3: Nine frames generated with North Coast Software's PhotoMorph depicting a lemon changing into an apple.

ferent features in the final image. In general, the more control points you use and the better you're able to correlate features in the two images, the more realistic the morph will appear. If you're morphing a fish to a man, for example, you might set up the control points so that the fish's front fins become the

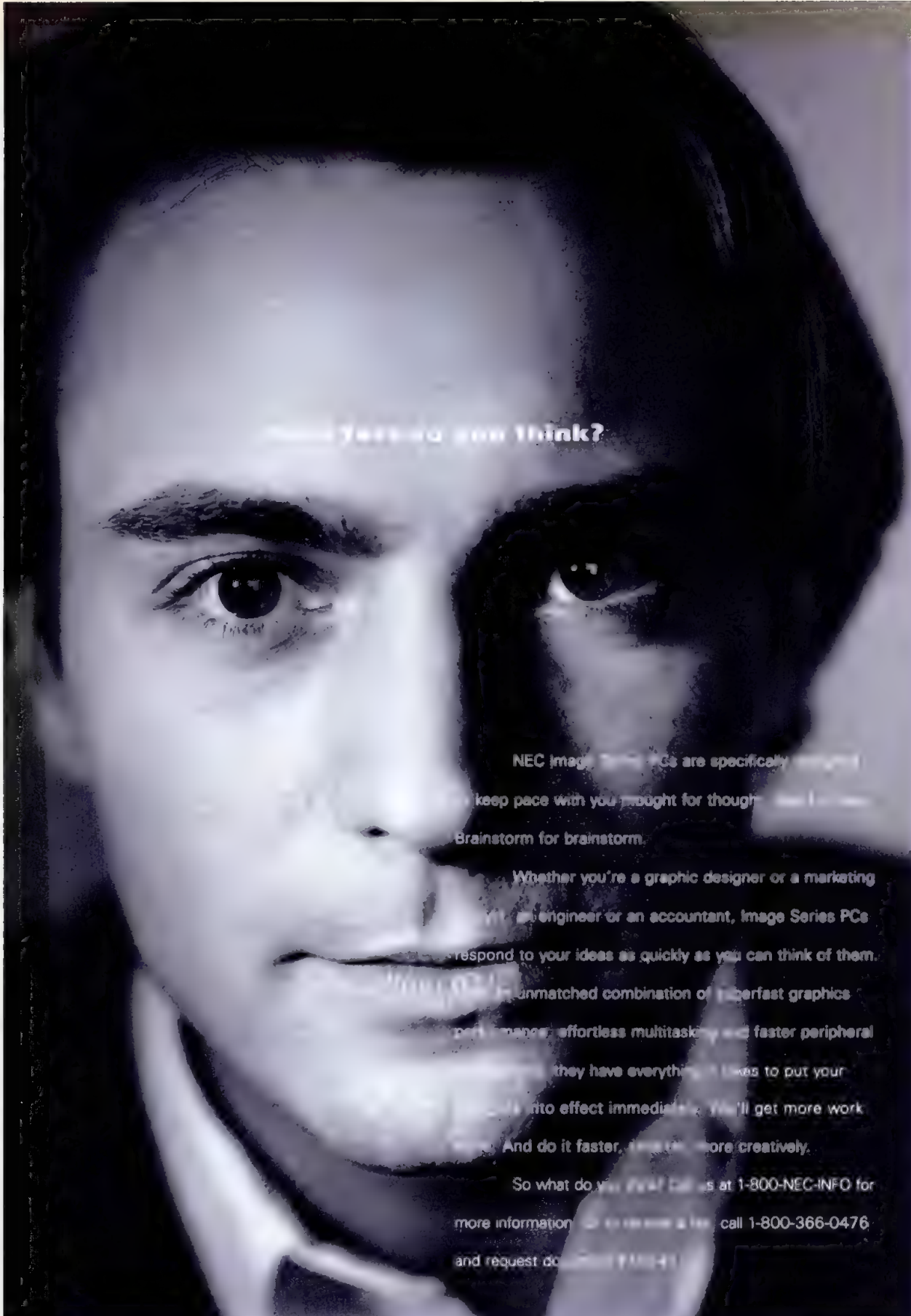
man's arms and the tail becomes the man's legs. In cases where features must grow out of an initially shapeless form, as in *Terminator 2*, it helps to have intermediate images serve as bridges between the starting and ending frames. (Animators at Industrial Light & Magic built models of Terminator's T-1000 fig-

ure in various stages of its metamorphosis into human form and used a process called *model interp* to generate scenes linking the models.)

FOR FURTHER STUDY There are several books available that describe how morphing is accomplished. Two of my personal favorites are Scott Anderson's

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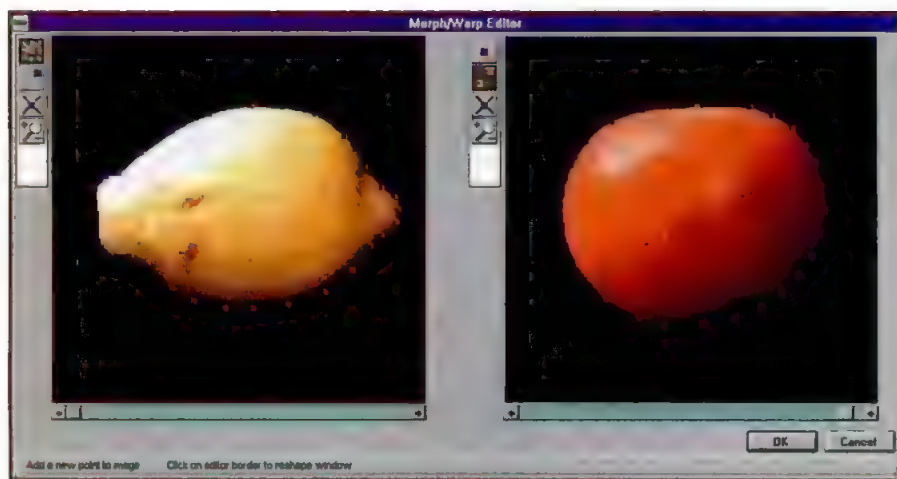


Figure 4: These points guide the lemon's gradual transformation into an apple. Each point in the source image has a corresponding point in the destination image; the positioning of these points allows the user to associate features in the source image with features in the destination image, producing more realistic morphs.

Morphing Magic (Sams Publishing, 1993) and Mike Morrison's *The Magic of Image Processing* (Sams Publishing, 1993). *Morphing Magic* treats morphing in detail and includes sample source code written in C, while Morrison's book cov-

ers a broader range of computer-graphics topics, including morphing. Both come with simple morphing programs that you can use to create your own morphs.

North Coast Software's *Morphology*

101, a new CD-ROM product that should be available by the time you read this, is loaded with practical morphing advice. *Morphology 101* demonstrates how mapping similar features in two otherwise very different images adds a crucial element of realism. If you're interested in exploring the finer points of morphing, you should definitely check out this product.

ON TO THE FUTURE Morphing software is still in its infancy on the PC, but it's getting bigger and better every day. Pentium- and PowerPC-based systems may one day be capable of producing morphs rivaling those you see in the movies, especially as video boards continue to improve in speed, resolution, and color-handling capability. If the version of OpenGL (the powerful 3-D rendering language originally developed for Silicon Graphics workstations) recently introduced for Microsoft Windows NT gains market acceptance, it too could play an important role in the continued evolution of morphing software. Stay tuned! □



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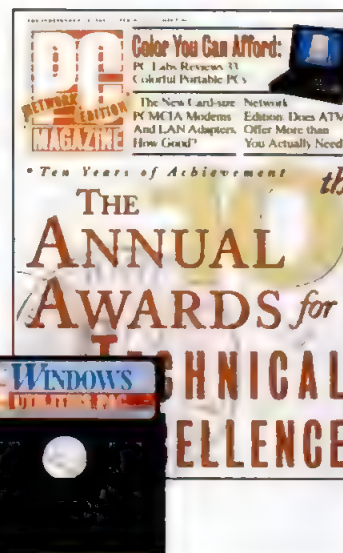
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Extending Your Apps

BY PAUL BONNER

Automatic Outlines: A Better Way to Manage Huge Files

The wealth of text-based information available through online services and informational CD-ROMs can be a curse at times. Within a few moments of logging onto ZiffNet's Computer Library or CompuServe's Microsoft Knowledge Base, for instance, it is easy to find yourself with a capture file several hundred kilobytes long containing dozens of downloaded articles. You know that the file is full of valuable information, but locating any particular item of data in it or even any particular article can be tricky in the extreme.

One solution is to import the capture file into a word processor and turn the file into an outline, assigning the highest outline level to the title of the article, the next highest level to the article summary or description, the next to the article keywords, and so on. This makes it simple to locate any article by collapsing the outline so that only the top-level headings or the first two or three levels of headings show. You then simply scan the headings for the information you need, ignoring the details of each article until you need them.

Of course, converting a big unformatted text file containing 40, 50, or 60 articles into an outline is a time-consuming, extremely tedious procedure. Fortunately, you can take advantage of the repetitive structure of these documents and the advanced capabilities of today's word processors to simplify this process. For instance, every Computer Library article has a Journal: field, identifying the publi-

cation from which the article was taken; a Title: field; an Author: field; and a Summary: field, summarizing the article's contents. Similarly, Microsoft Knowledge Base articles typically include a Title: field; a Document Number: field; a Product Name: field; a Product Version: field; an Operating System: field, identifying the operating system with which the article is concerned; and a Summary field.

This regularity is the key to automating the process, because it enables you to take advantage of advanced search-and-replace functions, such as those in Microsoft Word for Windows 6.0. These functions let you apply a style to every instance of a specified text string throughout a document. Because styles apply to an entire paragraph (defined as a block of text ending in a carriage return), searching for "Title: " and applying the top-level heading style to a line containing that string will make the entire line appear in that style, not just the "Title: " prefix.

This search-and-replace method allows you to format a document full of similarly structured articles simply by making decisions regarding heading levels for a single article. But although this method is an improvement over scrolling through the document line by line, it remains fairly tedious, involving many trips to the Re-

place dialog. Moreover, it does not offer a simple way to do other formatting tasks, such as entirely removing every line that begins with Article No.:

AUTOMATED OUTLINING The solution here is to automate the process even further by using the word processor's macro language. I did so using WordBasic, Microsoft Word for Windows 6.0's macro language. The new features in this version of WordBasic let me create a neatly self-contained little macro application called Auto Outliner, which functions as something close to an Outlining Wizard for structured documents. Auto Outliner allows you to indicate any number of words or phrases that WinWord should use as keys while formatting the document—applying Heading 1 style to paragraphs that begin with a certain phrase, deleting the paragraphs that begin with another, and so forth. In addition, Auto Outliner can be configured to carry out a number of additional common formatting tasks, including removal of empty lines and leading spaces, and conversion of multiple spaces to tabs.

*Let this WinWord 6.0
WordBasic macro
application organize long
text files so that you can
quickly find
information you need.*

Auto Outliner's home is a WinWord document template called AUTOOUTL.DOT. When you create a new document based on this template, a new toolbar appears at the top of your screen offering six text-based buttons labeled Insert File, Heading 1, Heading 2, Heading 3, Delete, and Launch Auto Outliner, respectively. The first button simply calls WinWord's built-in Insert File dialog box, allowing you to specify a file (such as a Computer Library capture file) that you wish to merge into the document. The next four buttons are used to identify key phrases that WinWord will use as search parameters while formatting the document, as well as the formatting that is to be applied to each phrase. For instance, if you want to format all the lines that begin with Title: in the Heading 1 style, you'd merely highlight one instance of Title:, and then click the Heading 1 button. (Both AUTOOUTL.DOT and an exam-

ple AUTOOUTL.INI file containing sample setups for use with Microsoft Knowledge Base and Computer Library articles are available on PC MagNet, in a file called ATOTOL.ZIP.)

Using Auto Outliner is a three-step process: First, you use Auto Outliner's toolbar buttons to specify the text WinWord should use to identify blocks of text to be given a specified style. Next, you interact with the Auto Outliner dialog box to verify those specifications and to specify other global replacement options. Finally, you launch the automated process by clicking the Run button on Auto Outliner's dialog box, at which point WinWord takes over and formats the document according to your instructions.

In the first of these steps, you use the four formatting buttons on Auto Outliner's toolbar to mark distinctive elements that WinWord can use to identify the paragraphs that are to be either styled as one of the three heading levels or deleted, as shown in Figure 1. Thus, if you wanted to have the title line of each document appear in Heading 1 style, you might highlight the characters "Title: " in the first document, and then click the Heading 1 button. This instructs Auto Outliner to style every paragraph containing that string as Heading 1 when formatting the document.

THE MARKING MACROS The four formatting buttons are linked to four macros called MarkHead1, MarkHead2, MarkHead3, and MarkDel1. Each of these in turn calls a subroutine named MarkHead (Figure 2) in the AutoOutline macro, which contains most of Auto Outliner's features. MarkHead takes one parameter—a numeric value indicating which button was clicked. Thus, the MarkHead1 macro, which is run when you click the Heading 1 button, calls the MarkHead subroutine as follows:

```
Sub MAIN
AutoOutline.MarkHead 0
End Sub
```

MarkHead2, MarkHead3, and MarkDel1 are identical except for the numeric

parameter that they pass to the Mark-Head subroutine.

MarkHead's job is to store both the current text selection and a flag (that indicates the style to be applied to this text) in a global variable for later use. To do this, MarkHead makes use of a WordBasic feature new to WinWord 6.0—document

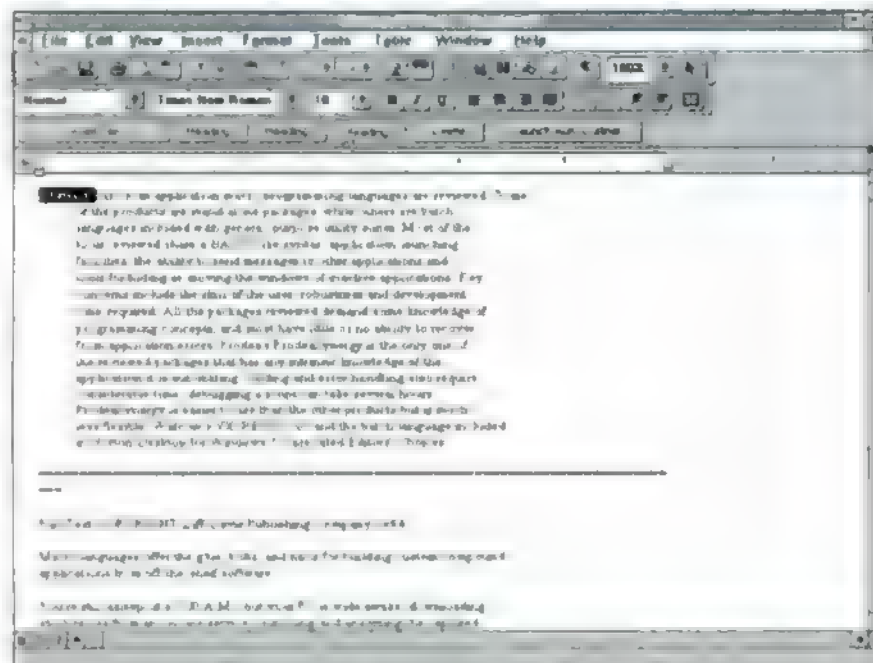


Figure 1: The first step in using Auto Outliner is to mark text selections that Auto Outliner can use to identify the paragraphs that are to be formatted with a heading style or deleted.

variables. Most variables created in a WordBasic macro exist only for the life of the macro; as soon as the macro terminates, the variable's name and contents are lost. Document variables, on the other hand, are stored with the current document, and thus can be used as global variables that enable one macro to store a value for use by another macro.

The first thing MarkHead does is ensure that the current text selection is a

```
Sub MarkHead(Level)
a$ = Selection$()
If CheckSel(Level, a$) = 1 Then
    a$ = a$ + "^^" + LTrim$(Str$(Level))
    ate = Val(GetDocumentVar$("aoVarCount")) + 1
    counter$ = Str$(ate)
    i = SetDocumentVar("aoVar" + LTrim$(counter$), a$)
    i = SetDocumentVar("aoVarCount", counter$)
    Print "Selection" + counter$ + " added to formatting list."
End If
End Sub
```

Figure 2: The MarkHead subroutine stores both the current text selection and the style to be applied to paragraphs containing that text.

valid tag for Auto Outliner's use. In general, Auto Outliner can utilize any text string as its search parameter. There are some strings, however, that are unlikely to produce the results that you want—particularly strings consisting of a single carriage return, a single space, or most other

single characters. So MarkHead begins by assigning the current selection to a temporary string variable called a\$, and then calls a user-defined function named CheckSel to determine whether a\$ contains a valid tag string.

TAGGING TEXT If a\$ consists of a single carriage return or a single space, CheckSel posts a message box saying, "Please select the text that you wish to tag for use with Auto Outliner." CheckSel then returns a value of 0 to MarkHead. If, on the other hand, a\$ consists of any other single character, CheckSel asks you to confirm that Auto Outliner is to style all paragraphs containing that character. This is necessary because the Selection\$() function that MarkHead uses to obtain the current text selection returns the character to the right of the text cursor, rather than an empty string, when there is no text selected in WinWord's edit window. Thus, if you click any of the Auto Outliner toolbar buttons without having first selected a block of text, a\$ will contain whatever character happens to appear after the cursor. There are times, of course, when a single-character tag will be valid; for instance, you might want to style or delete all paragraphs preceded by a number sign or a tilde. But in most cases, a single-character tag is a mistake, so CheckSel gives you the option to abandon the marking operation any time a\$ contains just a single character.

CheckSel returns a value of 1 if a\$ contains a valid tag. If it does, MarkHead proceeds to process a\$ by appending a code

a counter of the number of Auto Outliner variables associated with the current document. After incrementing that value by 1, MarkHead creates a new string variable consisting of the prefix aoVar followed by the newly incremented counter value and uses that string as the name of a new document variable in which the contents of a\$ are stored. Finally, MarkHead stores the

the selection text in a document variable, it exits; its job is done. This process repeats each time you click any of the Heading or Delete buttons, and the value of aoVarCount is incremented each time. This allows you to move through the document marking the distinctive text from each paragraph that you want to appear as a heading and from each paragraph that you want to delete.

Once done, you're ready for the next step in the Auto Outliner process: fine-tuning Auto Outliner's formatting procedure, which you can initiate simply by clicking on the Launch Auto Outliner button.

DYNAMIC DIALOGS The custom dialog box that appears makes use of the dynamic dialog-box capabilities new to this version of WordBasic. In earlier versions of WordBasic, dialog

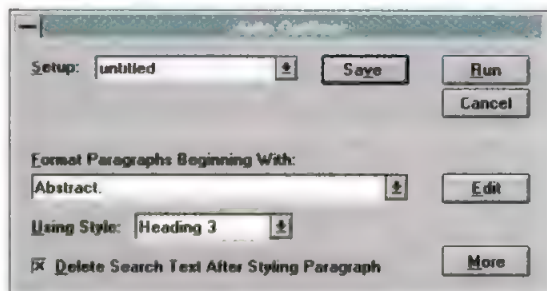


Figure 3: The main panel of Auto Outliner's dialog box allows you to edit the text selections you've made and save or recall named setups.

new counter value in aoVarCount.

Thus, if you've used Auto Outliner's toolbar buttons to mark five blocks of text in a document, aoVarCount will contain the string "5", and the five blocks you've marked will have been stored in a series of document variables named aoVar1, aoVar2, and so on. If the first block you marked contained the string "Title:", and you marked it for formatting as Heading 2, the document variable aoVar1 will contain the string "Title:~2".

This variable storage model allows Auto Outliner to track any number of text tags through the use of global document variables. When another Auto Outliner routine needs to make use of the text tags, it can determine the number of tags by determining the value of aoVarCount. Then, for each tag, it can determine the marked text by using the INSTR function to locate the double carets in the aoVarXX variable. Auto Outliner can then use the Left\$ and Mid\$ functions to extract the specified text and specified action from that variable, as follows:

```
sep = Instr(a$, "^^")
If sep > 0 Then*
    TaggedText$(x) = Left$(a$, sep - 1)
    Action(x) = Val(Mid$(a$, sep + 2))
End If
```

Once the MarkHead macro has stored

boxes were static objects that returned a value to the macro program only after they were closed—much like a standard message box. In contrast, dynamic dialog boxes inform the macro program of every action the user takes as it occurs, whether that action is clicking a check box or selecting a list box item. This in turn allows the macro program to respond to those actions by enabling or disabling other controls, hiding and showing new dialog panels, updating the contents of list boxes and other fields, and so on. Auto Outliner makes use of this capability both to update the contents or the state of various user-interface controls on its main panel in response to user actions and to display a second panel of options if the user clicks the More button. (In truth, Auto Outliner's dialog could have been designed to incorporate all options on a single panel. I elected to make use of a second panel that presents several options with a global scope, as opposed to the tag-specific scope of the main-panel options. I did this in order to demonstrate the multipanel capabilities of WinWord's new dynamic dialog boxes.)

In order to create a dynamic dialog box, you must supply the name of a dialog

box procedure in your dialog box definition. In contrast to Microsoft Visual Basic, which utilizes separate handler routines for each user-interface event (so the user clicking a button called Command1 would result in the program executing the routine Command1_Click), WordBasic responds to all events in a dynamic dialog box by calling the same routine. WordBasic passes the dialog box three parameters: a string supplying the name of the dialog control associated with the current event, a numeric value indicating the action that launched the event, and a numeric value providing supplemental information about the event.

The dialog box procedure generally takes the form of a giant Select Case statement that calls other routines based on the values of the three parameters passed to it. This organization will be familiar to C programmers, but Visual Basic programmers will have to adjust to the idea of having all user-interface events handled by the same routine.

GOING OUT WITH STYLES Auto Outliner takes advantage of WinWord's new dia-

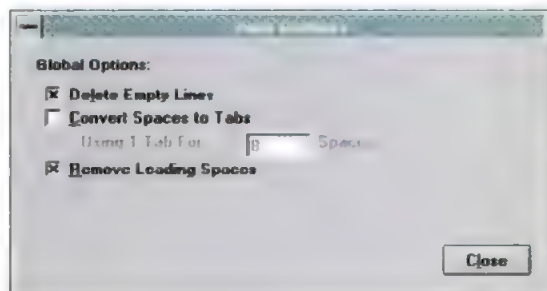


Figure 4: The secondary panel of Auto Outliner's dialog box provides access to additional formatting options. When the Close button is clicked, the controls on this panel are hidden, and those on the main panel are made visible.

log capabilities to obtain a variety of information concerning individual requirements. The main screen of Auto Outliner's dialog box allows you to edit any of the text selections that you've tagged and to modify the style assignment for each (Figure 3). The controls on the main panel are dynamically linked. When you select a tagged-text string from the drop-down list box that displays the tagged text, the style is updated to display the current style selection for that text. To change the style associated with a text tag, you merely select another item from the styles list.

So if you decide the Author: line

should be styled as Heading 3 rather than Heading 2, or you want to simply delete that line, you can select a new style for that text tag. In addition, for each tag, you can specify whether you want to delete the tag text after the style you've specified has been applied to the paragraph in which the tag was found. You might, for instance, want to specify that all paragraphs that begin with "Title:" are to be formatted as Heading 1 and that Auto Outliner should remove "Title:" from each paragraph after styling it. The Delete Search Text After Styling Paragraph check box allows you to do that.

When the Auto Outliner dialog is created, a routine called `PopulateCurrentMarkedTextArray` loads the contents of all the document variables that have been defined using the `MarkHead` routine. The text selections you've made are loaded into an array called `DropDownListBox3$()`, which is used to populate a drop-down list box labeled `Format Paragraphs Beginning With:`. A third array, called `DelText`, is used to store the state of the Delete check box for each text item.

The style assignment for each text selection is stored in a numeric array called `Actions()`. This routine does not erase the document variables it uses to populate these arrays. Instead, it leaves them untouched, allowing you to cancel the dialog box and select more text for styling, without losing your initial selections. The document variables remain active until you close the document or save the current settings to a named set using the `Save` button on the Auto Outliner dialog box. At this point, the contents of the document variables are stored in a private .INI file for later use. Once saved, named settings can be retrieved by selecting the desired settings from the drop-down list box labeled `Setup:`.

The `More` button brings up the dialog box's second panel (Figure 4), which presents several global formatting options. These options include the ability to remove empty lines from the document, to convert blocks of spaces to tabs, and to remove leading spaces from lines. At the

same time, the caption on the `More` button changes to `Close`, because clicking the button again will close the second panel, returning you to the main Auto Outliner dialog screen.

When the dialog box toggles back and forth between panels, it is not actually creating any new controls. All the controls for both panels are in the original dialog box definition. What's happening is that the controls on one panel are being hidden and those on the other are being revealed using WordBasic's `DlgVisible` command.

Multipanel dialog boxes such as this are a good way to break down the information-gathering functions of complex dialog boxes into easily digestible chunks. The important thing is to make the division among panels a natural one. In Auto Outliner's case, for instance, all the settings on the secondary panel relate to the entire document being formatted, while those on the initial panel relate to individual text selections. (That is, the `Delete Search Text After Styling Paragraph` check box can be set individually for each

update other controls. For instance, when you select a new tagged text selection from Auto Outliner's dialog box, Auto Outliner updates the `Delete Search Text...` check box and the `Using Style:` drop-down list to reflect the contents of the `DelText()` and `Action()` array elements associated with the newly selected text. In order to do this, Auto Outliner calls a routine called `NewSelection`:

```
Sub NewSelection
    'index number of texts list box
    i=DlgValue(7)
    'set action list box index
    DlgValue 9, Action(i)
    'set delete text check box
    DlgValue 11, DelText(i)
End Sub
```

Fortunately, this effort is well-rewarded. Dynamic dialog boxes considerably advance the WordBasic developer's ability to create solid custom applications in WinWord. Clearly, this allows you to create a more sophisticated user interface. But beyond that, they also extend the functional capabilities of custom WordBasic applications, because dynamic dialog boxes allow applications to interact to a much greater degree with the user. For instance, much of the flexibility that Auto Outliner brings to its formatting task would be all but impossible to implement with static dialog boxes alone, because determining the user's choices for some key aspects of Auto Outliner tasks would be very difficult.

Once you've edited your tagged-text selections and set all the other options in Auto Outliner's dialog, you can save the settings by pressing the `Save` button. These saved settings can be recalled by selecting the name you've given them from the drop-down list box labeled `Setup:`. Auto Outliner uses WordBasic's newly built-in ability to read and write private .INI files to save and recall named settings.

BORN TO RUN The final step in using Auto Outliner is to click the `Run` button, which launches the automatic-formatting process according to the options you've set in the Auto Outliner dialog box. The `RunChanges` routine that carries out this process starts by turning off screen updating in order to eliminate delays while WinWord redraws the screen. Then `Run-`

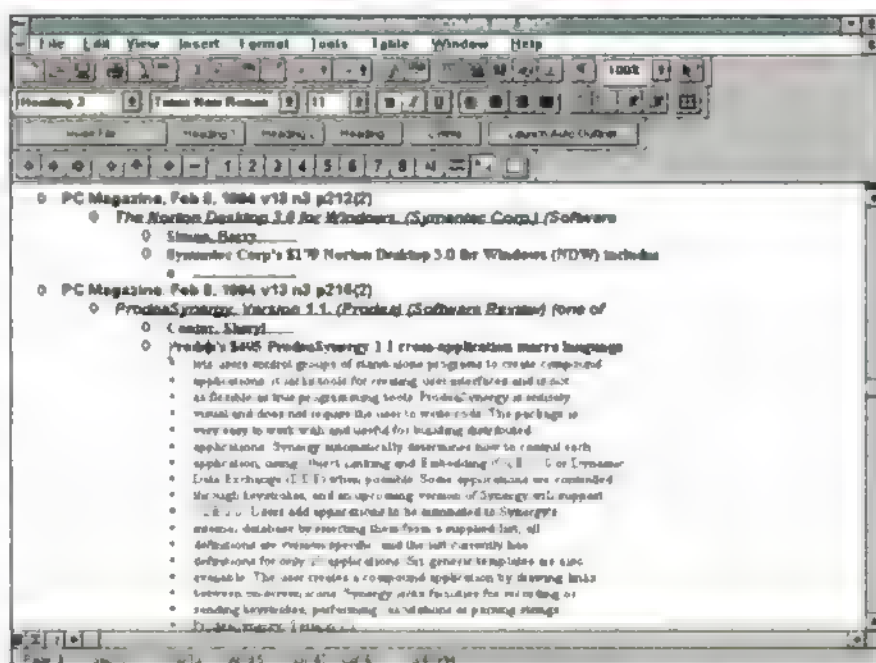


Figure 5: Once Auto Outliner has completed its formatting task, it displays the document in an outline view, allowing you to navigate easily among multiple formatted articles.

text selection, while the `Delete Empty Lines` check box can be set only once for the entire document.)

Multipanel dialog boxes, and dynamic dialog boxes in general, require considerably more effort on the part of the programmer than static dialog boxes. With static dialog boxes, you simply draw your dialog and be done with it, but with dynamic dialogs, there is all kinds of extra work to be done. You'll frequently want to synchronize controls so that a selection in one list, radio button, or check box will

Changes begins to loop through the array of tagged-text selections. For those tags that have an Action() value of 0, 1, or 2, indicating that paragraphs containing the tag text are to be formatted rather than deleted, RunChanges assigns the specified format to a temporary variable called a\$ and the tag text to b\$. RunChanges then executes the following routine, instructing WinWord to apply style a\$ to every paragraph in the document in which b\$ is found:

```
If b$ <> "" Then
    EditReplaceStyle .Style = a$
    EditReplace .Find = b$,
        .Replace = "", .Format = 1,
        .ReplaceAll
End If
```

If, on the other hand, you've indicated that Auto Outliner is to remove every paragraph containing the tag text, RunChanges uses the EditFind command to locate each instance of the specified text, highlights the paragraph in which the text is found, and then removes the paragraph

from the document:

```
EditFind .Find = b$, .Direction =
    0, .Format = 0, .Wrap = 0
While EditFindFound()
    ParaDown 1, 1
    EditClear
    EditFind
Wend
```

Once this process is complete, RunChanges loops through the array of tagged-text selections again and removes the tag text for the entries you've specified:

```
If DelText(i) = 1 Then
    StartOfDocument
    b$ = DropListBox3$(i)
    EditReplace .Find = b$,
        .Replace = "", .Format = 0,
        .ReplaceAll
End If
```

Following this, RunChanges makes additional use of WinWord's search-and-replace capabilities to convert blocks of spaces to tabs, to remove leading spaces

from lines, and to remove empty lines if you've indicated that it should do so. Finally, it calls the standard File Save As dialog to allow you to save the newly formatted file, and then switches to outline view to allow you to view the document in its newly outlined splendor (Figure 5).

Auto Outliner isn't the last word on automatic formatting. There's plenty of room on the More Options dialog panel for additional formatting options. No matter how many options you add to the dialog panel, some hand-formatting of documents is almost always required. Nevertheless, if you're careful about selecting the right text tags, Auto Outliner can greatly reduce the time it takes to turn downloaded text into a usable document. That it can do so reliably and with such ease demonstrates the power and flexibility of the latest incarnation of WordBasic. □

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Toolkits

BY NANCY NICOLAISEN

SPSS Offers Tools For Statisticians

Just as the letters IBM have come to mean *computers*, SPSS has come to mean *statistics*. The true meaning behind the initials is no longer really important.

SPSS traces its heritage from mainframe days but is by no means stuck in the past. SPSS for Windows (for more information, see "Statistical Analysis: Stat of the Art," May 11, 1993) melds the mainframe's statistical-computing power with the PC's ease of use, and the new SPSS 6.0 for Windows Developer's Kit (\$495) opens the SPSS engine up to OLE automation, localization, and extensions to statistical tools.

Developer's Kit does not include SPSS for Windows, which is required and is licensed separately. The SPSS for Windows base package starts at \$695, and advanced add-on components are sold separately. The Developer's Kit works exclusively with Version 6.0.1 of the SPSS engine.

ACCESSING SPSS THROUGH OLE 2.0

The most exciting feature of Developer's Kit is its OLE 2.0 capability. Developers can build new applications based on the SPSS statistical, reporting, and charting engine, using any tool that supports the inclusion of OLE objects. This extends the product's reach not only to development tools such as C++ or Microsoft Visual Basic but also to OLE-enabled applications, such as Microsoft Excel.

The OLE-automation server is provided in two forms: One includes the full range of SPSS features, such as the user interface and the back-end command processor. The "lite" version includes only the SPSS back-end command-processor language. OLE has a rather hefty footprint both in memory and on-disk, so the slimmed-down version is useful for devel-

opers who need only a subset of the SPSS capabilities.

The beauty of the OLE-automation servers is that they require only a couple of lines of code to plug into a VB-type programming project. Both servers support a single, top-level programmable object named `csps`. In VB, you dimension a variable of type Object, and then assign the automation server to the variable with the Set keyword, like this:

```
Dim SPSS As Object
Set SPSS = CreateObject( "spsswin
.csps" )
```

Object's methods let you execute menu commands, manage documents, handle data items and calculations, and run command sequences.

EXTENSIONS AND LOCALIZATION Developer's Kit provides a clean way to expand the native command set of SPSS. A new API (application programming interface) layer allows third-party applications to be launched from within SPSS using customized menu commands and to have unrestricted access to the SPSS data stream. To allow for this, third-party applications must support start-up command line processing and identify themselves in the Microsoft Windows Registration Database when they are installed.

The API draws a distinction between applications that need read-only access to the data stream and those that intend to modify the data. An additional requirement for applications that update the data is support for a DDE messaging scheme

to send modified files back to SPSS. This is needed because the SPSS engine itself is not fully OLE 2.0-enabled.

The toolkit's User Code Facility lets developers expand the native SPSS analytical tools with custom processing routines that are melded into the SPSS environment—a very useful capability for developing applications with lengthy preprocessing or postprocessing sequences. To help developers integrate their own tools, the documentation provides complete information on SPSS file structures.

The weakest aspect of Developer's Kit is its localization tools. Localization tools help developers adapt an application's language, time, and monetary notation to the user's locale. The SPSS localization tools provide a way to modify the location-specific elements of the user interface, but the statistical output is not modified, so the localization is incomplete. Localization tools are provided mostly with an eye to value-adding developers



who would like to create a distinctive appearance for their SPSS-based products.

A licensed user of Developer's Kit can distribute the SPSS OLE-automation components to licensed users of SPSS for Windows without paying royalties. But if developers want to bundle any part of SPSS for Windows with their applications, they must negotiate an agreement with SPSS. There is no stripped-down, runtime version of SPSS for Windows that developers can ship with their products.

SPSS 6.0 for Windows Developer's Kit lets developers mold the SPSS environment to suit the needs of specialized applications. Though developers who want to distribute standalone statistical toolsets will find the distribution requirements restrictive, the Developer's Kit offers impressive power and flexibility to statistical-analysis programmers.

► **SPSS 6.0 for Windows Developer's Kit** List price: \$495. Requires: *SPSS for Windows, Version 6.0.1, Microsoft Windows 3.1, 4MB RAM, 25MB hard disk space.* SPSS Inc., 444 N. Michigan Ave., Chicago, IL 60611; 800-543-2185, 312-329-2400; fax, 312-329-3668.

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Power Programming

BY MATT PIETREK

Dumping Code And Spying for Windows Clues

In a perfect programming world, all of an operating system's useful interfaces and behaviors would be documented. On top of that, the operating system would be flexible and full-featured enough to support the demands of any reasonable program. In this perfect world, you would be able to look up anything of use in the documentation, allowing you to treat the operating system's internal components like a black box. You wouldn't need to understand the internal behaviors and data structures of such an operating system, because understanding and using the documented interfaces would be sufficient for writing your program, library, or device driver. The fact that words like *undocumented* and *secrets* appear in many book titles indicates that the current state of Windows' documentation is less than perfect.

In the absence of complete documentation, having the source code to the operating system can be a surrogate source of information. Although you would have to look at other people's code (shudder!), the answer to almost every operating-system question can be found with enough digging through the operating-system sources. In the Unix world, access to the operating-system sources is a fairly common thing. Unfortunately for us programmers who work with Microsoft Windows 3.1 and the Win32 operating systems (Windows NT, Chicago, and Win32s), operating-system source code isn't available.

Insufficient documentation and source code unavailability are not just a problem when you're working only with the oper-

ating system. An application you're developing may need to interact with another application that's exact behavior is unknown to you. A typical example of this is when a programmer spends a great deal of time trying to pin down what DDE messages Microsoft Excel sends and in what order. Another example from Windows 3.1 is the program that, when run, stops other programs from running. The cryptic "Insufficient memory to run this application" message from Windows isn't a great deal of help.

When you're faced with a lack of documentation and support resources, often the only remaining course of action is to take matters into your own hands and reverse-engineer the relevant code. To some people, the phrase *reverse-engineer* evokes images of immoral young hackers cracking the piracy-prevention code in a program so that they can sell copies of the program on the street corner for five dollars. Another common image in reverse engineering is the programmer who reverse-engineers a popular application program in order to sell a cloned version of the program without doing any original work. However, there are several different types of reverse engineering. Professional programmers who use these techniques

rarely fit the above stereotypes. Rather, professionals use reverse engineering only as a last ditch effort to get past a particular problem when all other methods fail.

In this column, I'll discuss two relatively easy methods of reverse engineering used by Windows and Win32 programmers: file-dumping utilities and API-spying programs. In a future column, I'll describe the more complex process of reverse engineering with disassemblers. For each method, I'll describe the commonly available tools and give examples of how to use these tools.

REVERSE ENGINEERING OVERVIEW

The first step in reverse engineering is deciding which method to use. The easiest and most readily available method of learning the details of a piece of code is to use file-display programs, such as Borland's TDUMP or Microsoft's EXEHDR. These programs dump information in a structured format, which tells you, for example, the DLL functions a program uses.

These programs don't tell you about internal algorithms and data structures,

When you're faced with a lack of documentation and support resources, often the only thing to do is to take matters into your own hands and reverse-engineer Windows code.

though. Using file-dumping programs is relatively easy, but you may not be able to get all the information you need. To use an analogy, if you were trying to find out about a house and its occupants, file dumping is akin to conducting surveillance from across the street. You can see who enters and leaves the house, but what goes on inside, who knows?

The next level of snooping into the internals of a program is to use a spy program. Programs such as SPY, from the Microsoft Windows SDK, and WinSight, from Borland C++, show the Windows messages that a program sends and receives. Recently, programs such as Nu-Mega Technologies' Bounds-Checker for Windows and The Periscope Company's WinScope added the ability to see a program's calls to the operating system's API functions. You can even extend WinScope to spy on nonsystem DLLs. With all this information and a little bit of work, you can figure out how almost any

Major Dump Utilities' Capabilities

	TDUMP	EXEHDR	DUMPBIN	DUMPEXE
MZ files (DOS)	■	■	□	■
NE files (Win16)	■	■	□	■
PE files (Win32)	■	□	■	■
LE files (VxDs)	■	□	□	□
Debug info	■	□	■	■
Resources	■	□	■	■
OBJS	■	□	□	□
Disassembly	□	□	■	□
Key:	■ = YES	□ = NO		

Figure 1: Here are the capabilities of Borland C++ 4.0's TDUMP, Microsoft Visual C++ 1.0's EXEHDR, Microsoft Win32 SDK's DUMPBIN, and Symantec C++ 6.0's DUMPEXE.

piece of code is implemented. Returning to the above analogy, spy programs intercept the mail and listen in on phone conversations going into and out of the house.

Finally, when you need to know a program or DLL's internal algorithms or data structures, disassembly is the big gun. In the house-surveillance analogy, disassembly is like breaking down the front door and rifling through the house.

FILE-DUMPING TOOLS The usual first step in reverse engineering a program is to dump out the file's contents. This is a quick and easy way to get a handle on what type of file you're dealing with and what the file might be used for. Figure 1 lists the capabilities of some well-known tools that dissect a file's contents. If you develop with Borland C++, try out TDUMP.EXE from the \BORLANDC\BIN directory. If you develop with the 16-bit Microsoft C/C++, EXEHDR is your tool. If you use Microsoft Visual C/C++ 32-Bit Edition, the DUMPBIN program in the BIN directory works with Portable Executables and COFF (Common Object File Format) .OBJS produced by Microsoft 32-bit compilers. (If you have Microsoft SDK for Win32, the DUMPBIN program is embedded inside LINK.EXE and can be invoked with `LINK -dump <rest of command line>`.) As Figure 1 shows, no one program does everything, so it's a good idea to have several of them on hand. A good combination that would cover all the bases is Borland's TDUMP and Microsoft's DUMPBIN.

Before continuing, a bit of explanation on the file formats in Figure 1 is in order. All .EXE programs that run under DOS,

and OS/2, it needed a different executable format but a format that wouldn't make DOS choke if it encountered a newer executable. Each of these extended executables has a small DOS program at the beginning that prints out a message saying this program requires Windows, OS/2, Windows NT, or so forth. Following the DOS stub program in these files is another signature word that identifies which operating system the program requires. OS/2 1.x and 16-bit Windows programs use the "NE" signature (for New Executable). Windows VxDs have an "LE" signature (Linear Executable), while 32-bit executables written for Win32 implementations have a "PE" (Portable Executable) signature. These Win32 files are also sometimes referred to as COFF files, because they're derived from the Unix System V COFF format.

Sometimes the most useful information you get from a file-dumping program is the names of the DLLs and the functions that a program or a DLL imports. Often just knowing that a program uses a certain function is enough to get you going when you're stuck. For example, Windows 3.0 had no documented way for a program to change the desktop wallpaper, yet the Control Panel application was able to change the wallpaper. The capability had to exist somewhere in Windows. By running TDUMP or EXEHDR on the Windows 3.0 Control Panel program, you would have seen that the program made use of the undocumented SetDeskWallPaper function. (In Windows 3.1, the documented SystemParametersInfo API function takes over this task.) Of course, not all exported function names are illu-

minating (GDI.EXE's Death and Resurrection functions come to mind), but more often than not they are helpful.

Finding the functions that a 16-bit NE program or a DLL uses is a two-step process. The NE file doesn't contain a simple list of all the functions imported from other DLLs. Instead, you first need to find the fix-up data for the executable's segments. (If you use EXEHDR, you'll need to use the /VERBOSE switch to get the fix-up information.) A TDUMP version of a typical sequence of fix-ups that occurs in the Windows 3.1 CALC.EXE is

```
...
PTR 0AD9h GDI.91
PTR 0121h GDI.93
PTR 00EAh USER.89
PTR 0223h USER.90
PTR 04ADh USER.91
PTR 1DCAh USER.92
...
```

The important information here is the module name and the import ordinal at the end of each line. This program is importing six functions, two from GDI and four from USER. Function names such as GDI.91 aren't incredibly useful by themselves, so the second step of the process is to convert the module name (GDI) and ordinal (91) to a real function name. The translation between a function's name and its exported ordinal value is stored in the .EXE or .DLL file as well as in an import library. Since there's no easy way for Microsoft users to dump the contents of a 16-bit import library, I'll show how to get the function name from the DLL directly. Figure 2 shows a fragment of the Non-Resident Name Table section produced by running TDUMP on GDI.EXE. If you use EXEHDR, you'll find similar information in the section titled Exports:

Look at the TDUMP output for GDI.EXE. Notice that the function GetTextExtent corresponds to GDI.91. Putting two and two together, we can see that CALC.EXE calls GetTextExtent (GDI.91). The names of the other imported functions can be determined by repeating the above steps.

Finding the functions that a 32-bit PE file imports is much simpler. Running DUMPBIN on a Win32 program shows that a PE file contains a list of all the func-

tions the program imports. The list of imported functions is sorted by module. The following is a portion of the imports section obtained by running DUMPBIN on Windows NT's USER32.DLL:

```
9  BitBlt
12 CopyEnhMetaFileW
14 CopyMetaFileW
15 CreateBitmap
17 CreateBrushIndirect
18 CreateCompatibleBitmap
19 CreateCompatibleDC
```

The first number on each line is the *hint ordinal*. Win32 operating systems import functions by name, but the hint ordinal can speed up the process. The hint ordinal gives the loader a hint of where to start a binary search for the function name in the DLL that exports the functions.

Examining USER32.DLL's import table, we can see that USER32 calls GDI functions, such as BitBlt and CopyEnhMetaFileW. Note that when USER32.DLL has a choice of calling either an ASCII or a Unicode version of the function, it calls the Unicode version (CopyEnhMetaFileW, CopyMetaFileW—the W stands for *wide character*). This is consistent with Microsoft's claim that NT uses Unicode strings internally.

While it's very useful to know what API functions an .EXE or DLL uses, the flip side is equally important. File-dumping programs can show you what API functions a DLL exports for use by other programs and DLLs. The exported-function names are often a dead giveaway to what the DLL does and what its capabilities are. Sometimes a name by itself is enough information to enable you to guess what the parameters to an undocumented function are. Other times you'll need to use disassembly techniques along with the exported-function names to figure out how to call an undocumented DLL function.

Figure 3 shows the TDUMP output of the exports from a 16-bit NE file, SPELL.DLL. This DLL comes with Microsoft

Word for Windows 2.0, but its API is not documented. Some of these function names give clues as to what they do and how you might call them. SpellVer probably doesn't take any parameters and probably returns a version number in the AX or DX:AX registers. It's very easy to write a small test program that tests this theory. You'd create a prototype for the function—`DWORD SpellVer(void);`—call LoadLibrary and GetProcAddress to get a

```
Non-Resident Name Table  offset: 02A8h
Module Description: 'Word for Windows v. 2.0
Spell Checker DLL'
Name: SPELLOPENUDR      Entry: 8
Name: SPELLGETSIZEUDR   Entry: 13
Name: SPELLADDUDR        Entry: 9
Name: SPELLOPTIONS      Entry: 3
Name: SPELLDELUDR        Entry: 11
Name: SPELLTERMINATE     Entry: 5
Name: SPELLADDCHANGEUDR  Entry: 10
Name: SPELLINIT          Entry: 2
Name: SPELLVER            Entry: 1
Name: SPELLCLOSEMDR      Entry: 15
Name: SPELLCHECK         Entry: 4
Name: SPELLVERIFYMDR     Entry: 6
Name: SPELLOPENMDR       Entry: 7
Name: SPELLCLOSEUDR      Entry: 16
Name: SPELLCLEARUDR      Entry: 12
Name: SPELLGETLISTUDR    Entry: 14
```

Figure 3: The TDUMP output of the exports from SPELL.DLL, a 16-bit NE file.

pointer to the function, and then call SpellVer. Afterwards, you'd look at the DX and AX registers to see if they were set with values that resemble version numbers. Well, wouldn't you know, I wrote a small program to test this and discovered that the function always returns 0. Resorting to disassembly, I discovered that the SpellVer function actually takes three far pointers to WORDs (LPWORD). The lesson here is that file dumping is the easiest form of reverse engineering, but it doesn't always give you adequate information.

On the Win32 side of things, Figure 4 contains a portion of the output from running DUMPBIN on the Windows NT KERNEL32.DLL file. The figure shows two things of importance. First, several of the exported API functions have two variations (for example, AddAtomA and AddAtomW). AddAtomA is the version of AddAtom that uses ASCII strings,

while AddAtomW is the equivalent function that uses Unicode strings. Second, the number at the end of each line is the relative virtual address (RVA) of the function in the module. A disassembler can use this address to match a symbolic name to a specific section of code.

Moving to a somewhat darker subject, we see in Figure 5 a selection of the DUMPBIN display of NTDLL.DLL's exported functions. Many of these undocumented functions uncovered by Microsoft's own DUMPBIN do the real work of creating processes, managing memory, and so on. You might be thinking, "This is nice, but I probably can't use NTDLL.DLL myself." Wrong! If you run DUMPBIN on a Windows NT program, such as WPERF.EXE, you'll see that they call undocumented NTDLL.DLL functions, such as NtQuerySystemInformation. So much for Microsoft's claim that undocumented API functions aren't of any use to application programs!

Besides the functions that an .EXE or a DLL imports or exports, you can often gain additional insight into a file by examining some of its text strings. One of the most useful text strings is the description field. The linker puts whatever you specify on the DESCRIPTION line of the .DEF file into the executable's description field. In 16-bit NE files, the description string is the first entry in the Non-Resident Name Table. Figure 6 shows some typical description strings from the files in the Windows 3.1 WINDOWS directory.

In 32-bit PE files, the Microsoft linker puts the description string somewhere in the .rdata section. Unfortunately, there doesn't appear to be any consistency in its placement. If you want to see these strings, your best bet is to do a raw hex dump of the .rdata section and look for an embedded ASCII string. Also, since the Microsoft Win32 tools generally don't need a .DEF file, you'll find many files that don't have a description string.

Another interesting place to look for useful strings after dumping an .EXE or a DLL is in the resource section. In both Win16 and Win32 programming, you can specify resources by ordinal number or by

```
Non-Resident Name Table  offset: 0C41h
Module Description: 'Microsoft Windows Graphics Device Interface'
Name: GETWINDOWEXTEX     Entry: 474
...
Name: GETTEXTTEXTENT     Entry: 91
```

Figure 2: Here is a fragment of the Non-Resident Name Table produced by running TDUMP on GDI.EXE.

name. Sometimes dialogs have interesting names or hidden controls that are outside the dialog rectangle. String-table resources often contain goodies that you may ordinarily never see. For instance, in the TAIPEI.EXE game from Microsoft, the program rewards you with a proverb if you win a game. If you want to see all the possible proverbs, you can either master the game

ordinal	hint	name
1	0	AddAtomA (00005090)
2	1	AddAtomW (00005100)
3	2	AddConsoleAliasA (00025540)
4	3	AddConsoleAliasW (00025500)
5	4	AllocConsole (00026ac0)
6	5	BackupRead (00001000)
7	6	BackupSeek (00001e90)
8	7	BackupWrite (00002100)

Figure 4: Here is a portion of the output you get from running DUMPBIN on the Microsoft Windows NT version of KERNEL32.DLL.

or cheat like I did and just dump out the string tables. Programs such as Borland's Resource Workshop let you view and edit the resources in any file interactively.

The jackpot of reverse engineering with file dumpers is when you encounter a file that still contains debugging information. From the debug information in an executable, you can learn the names of all the executable's functions and variables. Along with the functions' and variables' names, the debug information contains the addresses of these symbols. The debug information also holds the types of the variables, the argument lists for the functions, and the layout of the structures and classes. In short, the debugging information contains almost everything about your program that you wouldn't want a competitor to know. I once shocked a programmer by telling him about a GP fault in his code and on what line it occurred. No, I didn't have the source code. The debug information alone was enough for me to pinpoint the problem. Your competitors may not be so nice! This is why it's important to check that you don't ship debugging information with your product. Many companies, including Microsoft, Borland, and Delrina, have been guilty of this in the past. Run SOUNDREC.EXE from Windows 3.1 through TDUMP or Microsoft's CV-DUMP if you don't believe this.

While I've been focusing on file dumping of .EXEs and DLLs, you shouldn't overlook the wealth of information that can

be found in other related files. In particular, .OBJ and .LIB files contain quite a bit of information about a given source module (or collection of modules). Borland's TDUMP takes apart Intel OMF (object module file) .OBJ files to show you public and external symbols, segment names, and so on. Symantec C++ includes the OBJ2ASM utility, which symbolically disassembles the code contained within an Intel OMF .OBJ file. The Win32 DUMPBIN program performs general purpose .OBJ file dumping as well as disassembly of COFF .OBJ files.

SPYING TOOLS File dumping can be interesting and informative, but you often need to know more about the code in question. Tools that let you spy on a program's interactions with the operating system can be more than up to the task. The most familiar Windows spying tools are the message-spying programs, SPY, from Microsoft, and WIN-SIGHT, from Borland. Message-spying programs show the messages that a window receives and how the program responds to these messages.

While message-spying tools are useful, programmers often need more information to get to the root of what they're trying to figure out. Recently, programs such as Nu-Mega's Bounds-Checker for Windows and Periscope's WinScope have raised spy tools to a new level. Besides spying on messages, these programs intercept API calls that a program or its DLLs make. Additionally, these spy programs monitor and log window hooks, TOOLHELP notifications, and other callbacks.

These programs put "probes" at all the well-defined places where controls enter or exit the program's code—such as window procedures and API calls. The information that passes across these boundaries is located in a predictable manner. For example, all window procedures are called with a consistent set of parameters on the stack (the HWND is at [BP+0E],

the MSG number is at [BP+0C], and so on). Spy programs take advantage of this knowledge in order to save, analyze, and display the information.

The best spying tools are those that don't require any modification of the code you're spying on. To insert their probes, programs such as Bounds-Checker for Windows and WinScope rely solely on the information in the executable file and the calls it makes.

As a result, these programs can spy on almost any .EXE or DLL, even those that you can't relink or modify in some way. A second class of spying tools requires you to relink the code you wish to spy on.

These tools work by fooling the linker into resolving the program's API function calls to point to the tools' own code rather than to the operating-system DLLs. A closely related class of tools modifies the executable file after they've been linked. The net effect is the same. The spy program redirects function calls to the tool's own code, which logs the call before passing control to the operating system.

For 16-bit Windows applications, there are a variety of spying tools available. The primary purpose of Bounds-Checker for Windows (BCHKW) is to find bugs by intercepting all the Windows API function calls and certain C library calls that a pro-

ordinal	hint	name
...		
17	16	DbgBreakPoint (0000cca0)
18	17	DbgPrint (0000ccc0)
...		
3A	39	NtAllocateVirtualMemory (0000c210)
...		
4A	49	NtCreatePagingFile (0000c310)
4B	4A	NtCreatePort (0000c320)
4C	4B	NtCreateProcess (0000c330)
...		
9D	9C	NtQuerySystemInformation (0000c820)
...		

Figure 5: A selection of the DUMPBIN display of NTDLL.DLL's exported functions shows some extremely useful undocumented functions.

gram makes, and then validate the parameters. To give a clearer picture of the sequence of events that lead up to a bug, Bounds-Checker also watches window and dialog messages, hook callbacks, TOOLHELP notifications, and other assorted callbacks. If you save the trace information to a disk, the accompanying TVIEW program shows an expandable/collapsible hierarchical view of your program's events. TVIEW can filter out repetitive sequences

of function calls and messages that you're probably not interested in. A typical sequence of this sort would be

```
GetMessage
TranslateMessage
DispatchMessage
Window Message
DefWindowProc
```

Although Bounds-Checker takes advantage of debug information when it's checking for bugs, this information isn't necessary for its spying capabilities. As a result, you can run Bounds Checker for Windows with any Windows program.

Unlike Bounds-Checker for Windows, which concentrates on one program at a time, Periscope's WinScope is a system-wide spy tool. You'll see all the API function calls, hooks, and messages that occur anywhere in the system.

Sometimes this is very useful, while at other times it leads to information overflow. Fortunately, WinScope provides a very high level of customization to let you select what you want to spy on. You can enable or disable spying on individual windows, API functions, or groups of API functions. The same applies to Windows messages and hooks. Like Bounds-Checker for Windows, WinScope can save a copy of the memory that a function's far-pointer parameters point to. This enables you to see the actual strings and data structures that were passed to CreateWindow, to GetPrivateProfileString, and so on. WinScope uses the information in an NE file to hook calls to the Windows API, so you don't need to relink the code you want to spy on.

If you're willing to sacrifice usability and some features for price, you might consider Microsoft's API parameter profilers. Although both 16- and 32-bit versions of these spying tools appear on the Windows NT SDK, very few people know of their existence. The Microsoft profiler is crude in its implementation and requires you to modify the .EXEs or R.DLL, ZERNEL32.DLL, and ZSER32.DLL). Each DLL has the same base filename as an operating-system DLL but with the first letter changed to Z. These special DLLs have a small stub for each API function exported from the DLL they replace. You connect your program or DLL to these special

Program	Description Strings
CHARMAP.EXE:	"Utility for easily selecting special characters."
SSFLYWIN.SCR:	"SCRNSAVE: Flying Windows"
DRWATSON.EXE:	"System Diagnostic Utility"
MORICONS.DLL:	"MS-DOS Application Icons For Windows 3.1"
CALC.EXE:	"Microsoft Calculator: Developed by Craig Brockschmidt"
HELPHK.DLL:	"F1 == Help Keyboard Hook"
VBRUN100.DLL:	"Microsoft Visual Basic Runtime Vers on 1 00, Copyright © 1990-1991 Microsoft Corp."

Figure 6: Here are some typical description strings from the files in the Microsoft Windows 3.1 WINDOWS directory.

DLLs with the APFCNVRT program (or APF32CVT for you Win32 users). APFCNVRT and APF32CVT modify the program's executable file so that that program imports its functions from the parameter-profiling DLLs rather than the normal operating-system DLLs. When you run the modified program, all calls to the affected DLLs go through the parameter-spying DLLs before they're passed on to the operating system.

Another Win32 spy program is Nu-Mega's Bounds-Checker32 for Windows NT (BCHK32NT), which spies on calls to the Win32 API, window messages, and hooks. For the most part, Bounds-Checker32 for Windows NT is similar to Bounds Checker for Windows. However, it includes features not present in its Windows 3.1 sibling. When a Win32 function fails, the function usually stores an error code with SetLastError indicating why the call failed. Bounds-Checker32 for Windows NT knows when an API function fails and records the error code. Also, since Win32 supports threads, Bounds-Checker32 for Windows NT saves the thread ID for each

function call and window message. Its TVIEW program uses the thread information to provide additional filtering options, such as showing only the events for a specified thread.

When evaluating a spying tool, make sure you know what parts of the system the toolkit allows you

to watch. In API spying, the program events that the spying tool can't show you are often the difference between figuring out what's going on and scratching your head in confusion.

As a rule of thumb, the more data points (API function calls, window messages, hook callbacks, and TOOLHELP notifications) you record, the better. For instance, the Microsoft parameter profiler is useless if you're trying to figure out how a program uses TOOLHELP to perform some action. It doesn't have a ZOOHELP.DLL to

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```

WNMSG:  HWND:0049016E MSG:WM_COMMAND(0111) WPARAM:00000006 LPARAM:00000000
APICALL: GetWindowLong(HWND:0049016E, WINDOWLONG:GWL_STYLE)
APIRET:  GetWindowLong returns LONG:14CF0000
APICALL: SetWindowLong(HWND:0049016E, WINDOWLONG:GWL_ID, DWORD:00000000)
APIRET:  SetWindowLong returns LONG:BE00F2
APICALL: SetWindowLong(HWND:0049016E, WINDOWLONG:GWL_STYLE, DWORD:14840000)
APIRET:  SetWindowLong returns LONG:14CF0000
APICALL: SetWindowPos(HWND:0049016E, HWND:00000000, DWORD:00000000,
DWORD:00000000, DWORD:00000000, DWORD:00000000, SWP_FLAGS:
00000027:SWP_NOSIZE:SWP_NOMOVE:SWP_NOZORDER:SWP_FRAMECHANGED)

```

Figure 7: This is part of a trace done on Microsoft Windows NT's CLOCK.EXE with Bounds-Checker32 for Windows NT. These calls accomplish CLOCK's No Title option.

watch calls to TOOLHELP.

A SPYING ADVENTURE Let's solve a real world problem to see these tools in action. A common question I hear relates to the Windows CLOCK.EXE program: "How do I make my program switch between having a title bar and not having a title bar, as CLOCK.EXE does?" You can find the answer by using a spy program to see what function calls CLOCK .EXE makes. I'm going to use the 32-bit CLOCK.EXE program from NT. I could just as easily have used the 16-bit CLOCK .EXE from Windows 3.1, though.

For my tool, I'll use Bounds-Checker32 for Windows NT, although any of the spying tools that spy on API functions I've mentioned would do. The first step is to run the program and collect the trace information. Run Bounds-Checker32 for Windows NT, select CLOCK.EXE from the File | Load dialog, and choose Run. After CLOCK starts up, click on Settings | No Title. Then shut down CLOCK. You can then examine the trace output and find the spot where the program responded to the No Title command. Figure 7 shows a text-file version of the relevant parts of the trace.

You might be wondering, "How did he know where to look in the trace information?" Whenever you select something from a menu, Windows delivers a WM_COMMAND message to your program. Therefore, the first step in finding this sequence of events is to search for the string "WM_COMMAND". If you followed the above steps, there should only be one WM_COMMAND message in the entire event log.

For the sake of completeness, however, let's verify that the WM_COMMAND message in Figure 7 is the correct one. In a WM_COMMAND message, the WPARAM parameter holds the ID of the

selected menu item. In the figure, WPARAM is 6. If you dump the resources in CLOCK.EXE with Resource Workshop or a similar program, you'll see that the No Title menu item has an ID of 6. We're now sure that we're looking at the right section of the event log.

After receiving the WM_COMMAND message that tells CLOCK to turn off its title bar, CLOCK calls GetWindowLong, passing the GWL_STYLE parameter. The next line of the figure shows that GetWindowLong returned a DWORD of 0x14CF0000. This value represents the WS_xxx style bits passed to CreateWindow. You can decode these bits yourself by looking in WINDOWS.H:

```

#define WS_VISIBLE          0x10000000L
#define WS_CLIPSIBLINGS    0x04000000L
#define WS_BORDER           0x00800000L
#define WS_DLGFRAME         0x00400000L
#define WS_SYSMENU          0x00080000L
#define WS_THICKFRAME       0x00040000L
#define WS_MINIMIZEBOX      0x00020000L
#define WS_MAXIMIZEBOX     0x00010000L
=====
0x14CF0000

```

For the sake of clarity, temporarily ignore the next two lines in the figure (I'll come back to them in a little while). After CLOCK has retrieved its style bits with GetWindowLong, it sets a slightly different set of style bits with the call to SetWindowLong. In this call, the style bits are 0x14840000. Apparently, CLOCK retrieves its WS_xxx style bits, modifies a few of them, and then sends the revised style bits back to the window. So what styles did CLOCK change? Comparing the original 0x14CF0000 with the new 0x14840000, we can see that the new style DWORD is missing the following styles from the original value:

```

#define WS_DLGFRAME        0x00400000L
#define WS_SYSMENU         0x00080000L
#define WS_MINIMIZEBOX     0x00020000L
#define WS_MAXIMIZEBOX    0x00010000L

```

This is consistent with CLOCK behavior. When you select the No Title menu item, the system menu and the minimize and maximize buttons go away.

Let's return to the two skipped lines. The first of these lines is a call to SetWindowLong. This line appears to be setting the window's control ID (GWL_ID) to 0. With only that information to go on, you're probably confused as to what the intent is. Here's the secret: All windows have an internal field that can be either a control ID or a *menu handle*. Child windows (such as dialog-box controls) use this field to hold their control ID. Top-level windows (such as CLOCK.EXE's) use this field to hold a menu handle (HMENU). (For official verification of this, refer to the hMenu field description in the documentation for CreateWindow.) Knowing this obscure fact, you can see that CLOCK.EXE sets its window's HMENU to 0. It may have been clearer if CLOCK had used SetMenu to change the HMENU value. But this seemingly gratuitous use of undocumented functionality can be explained. The last line in the trace calls SetWindowPos. This call forces Windows to repaint the window. Had the code called SetMenu, Windows would have forced the window to redraw prematurely—that is, before the SetWindowLong call that changes the style bits and before SetWindowPos.

CONCLUSION Using commonly available file-dumping and API-spying programs, you can peer into a program's operations to see how it works. In many cases, this is all the reverse engineering that you need to get the job done. In a follow-up column, you'll learn how to use disassemblers for those situations when you need to bring even more power to bear on the problem. □

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Utilities

BY JEFF PROSISE

Save Paper: Print With WINPRN

If you need to fit more than one page on a sheet of printer paper, would like drag-and-drop printing, and want to save on paper consumption too, our utilities can help. You might remember Bob Flanders and Michael Holmes' LASERLST utility, which appeared way back in the April 11, 1989 issue ("Landscape Mode to the Rescue"). By taking advantage of the HP LaserJet II's ability to print text in landscape mode, LASERLST let you print text files two pages on a sheet sideways.

LASERLST is one of my favorite DOS utilities, but ever since I started doing most of my work in Microsoft Windows, I've longed for a Windows version of LASERLST. In theory, a Microsoft Windows 3.1 version of LASERLST could be even more powerful than the DOS version. This is because Windows' TrueType fonts, which are scalable to any size, offer a higher degree of flexibility than the static fonts built into the HP LaserJet II. LASERLST was limited to two pages per sheet, because it couldn't scale the LaserJet's built-in line-printer font. A Windows utility using TrueType fonts could make text as small as it wanted, easily printing four pages per sheet. As an added bonus, because of Windows' device-independent printer interface, a Windows version of LASERLST would work with all printers, not just HP LaserJets.

That's why I wrote WINPRN. WINPRN is a Windows text-printing utility that prints text files in 1-, 2-, and 4-page-per-sheet formats. It's great for printing long program listings and other text files and for fitting as much information as possible into a small space. I find browsing long program listings much easier when I condense 40 pages into 10 and

four times as much information on each page. WINPRN is also useful for archiving hard copies of long text files.

In addition to serving end users, WINPRN also provides an opportunity for Windows programmers who have never written a program that sends output to the printer to get acquainted with the mechanics of printing in Windows. Writing these programs isn't easy, but you can get some powerful results. WINPRN and its source code can be obtained free of charge by downloading the files from PC MagNet or by mail. For details, refer to the sidebar "Guide to Our Utilities & How to Get Them."

USING WINPRN To install WINPRN, simply copy WINPRN.EXE to your hard disk and use Program Manager to add the program to a Windows group. Removing WINPRN from your system is equally simple. All you have to do is open a command prompt window, go to the directory where

WINPRN.EXE is stored, and type DEL WINPRN.* to delete WINPRN.EXE and WINPRN.INI. You can use File Manager to perform the equivalent operation.

To print a file with WINPRN, click the Select File button and select (or enter) the name of the file you wish to print. The filename will appear at the bottom of the WINPRN window. Next, choose a page layout—one, two, or four pages per sheet—from the Layout window by clicking the desired layout with the left mouse button. If the layout you wish to select is not visible, use the scroll bar to scroll it into view. The currently selected layout is highlighted in yellow (see Figure 1). When you're ready to print, click the Print button—the large button with the printer icon. To cancel a print job before printing is complete, click the Cancel button in the Printing dialog box.

An alternative method for printing files—and a way to queue up several files at once—is to select the files in File Manager, and then drag them from the File Manager window to either the WINPRN window or the minimized WINPRN icon. WINPRN will print the files using the current option settings. Clicking the Cancel button while you're printing files dragged from File Manager cancels not just the current file but the files that come after it, too.

Clicking WINPRN's Options button displays the dialog box in Figure 2. In it, you can specify five options: typeface, tab length, page outlines, page headers, and paper size.

WINPRN uses only fixed-pitch fonts so that columns line up correctly in tables and in program listings. The Typeface combo box specifies the font typeface that WINPRN will use and displays all the fixed-pitch TrueType fonts that are installed on your system. At the very least, this box should display Courier New, which is one of the base TrueType fonts provided with Microsoft Windows 3.1. If you have other fixed-pitch TrueType fonts installed, they should show up here also.

Tab length lets you specify the number of spaces between tab stops, information that WINPRN uses when it expands tab characters (ASCII 09h). You can choose 4 or 8 (the two most common tab settings) from the drop-down list box, or you can enter another value in the combo box's edit field. Valid values range from 1 to 32.

Top 10 Utilities

Rank	Utility
1	PRN2FL - Captures printer output
2	MONTOR - Monitors system resources
3	PGDEZP - Extracts .ZIP files
4	INPUTT - Text-input batch files
5	WTIME - Keeps PC clock accurate
6	BAT2EX - Compiles batch files
7	CONFIX - Issues boot-time commands
8	FONED1 - Creates mnemonic phone numbers
9	TED - Tiny screen editor
10	PCMCVT - Strips word processing codes

This list is based on the total number of downloads each utility has had on PC MagNet over the past 12 months. To download these files, type GO ZNT:TIPS. For more information, see the sidebar "Guide to Our Utilities & How to Get Them."

The "Print page outlines" and "Print page headers" check boxes give you added control over WINPRN's output. If "Print page outlines" is checked, WINPRN outlines each page on the printed sheet with a rectangle. If "Print page headers" is checked, WINPRN prints a header at the

Windows supports the concept of default printers in order to simplify printing on PCs with two or more printers. WINPRN always prints to the default printer. If you wish to send output to a printer other than the current default, you can change the default printer through the Printers applet in Control Panel. Double-click the Printers icon, select the printer you want to designate as the default, and then click the Set As Default Printer button. Close the dialog box, and the specified printer will now be the default.

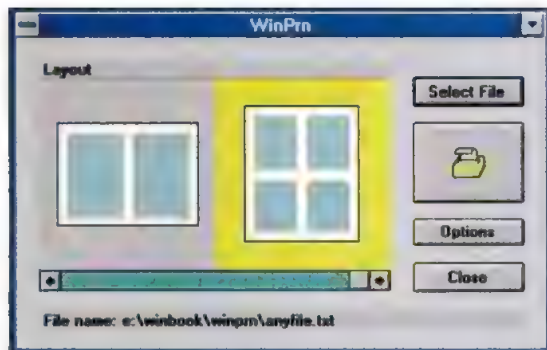


Figure 1: Here the WINPRN window is poised to print a file named ANYFILE.TXT four pages to a sheet. The selected layout is highlighted in yellow.

top of every page. The header includes the current date, filename, and page number. Printing is considerably faster if you leave "Print page outlines" unchecked, because it takes time for the printer driver to rasterize the rectangle outlining the page. The "Print page headers" option has no noticeable effect on print speed.

The radio buttons in the Paper Size box specify the paper dimensions that WINPRN uses to format its output so that margin sizes are roughly the same all around. By default, WINPRN is set up to format output for letter size (8.5- by 11-inch) pages. If you use A4-size paper, select the A4 option and WINPRN will adapt its output accordingly. Another feature added for the benefit of international users is the date format used in page headers. Rather than assume the month/day/year format that is popular in the United States, WINPRN consults the [intl] section of WIN.INI for the user's preferred date format, which can be specified through the Control Panel.

Like any good Windows program, WINPRN saves your selected options across sessions. If you enter a tab length of 7, for example, the tab length is automatically set to 7 the next time you start WINPRN. Option settings are saved in a private .INI file named WINPRN.INI, which WINPRN creates in the same directory as WINPRN.EXE.

With a little luck, you'll never see one of these messages. Just in case you do, however, Figure

3 lists a few of the most common errors and what you can do to correct them.

WINPRN contains some special code to work around a bug in HP LaserJet 4 printer drivers that would otherwise prevent the program from working on those printers. If WINPRN won't run on your system and you suspect the printer driver is the cause, post a message to me on PC MagNet's Utilities/Tips or Programming Forum, and I'll see if I can devise a

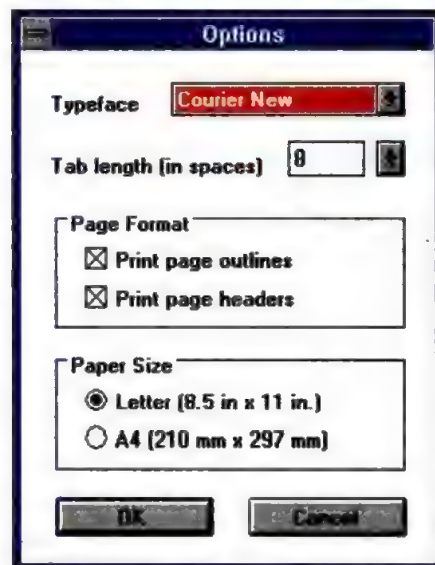


Figure 2: The Options dialog box contains controls for selecting the typeface and tab length and for specifying whether pages should include outlines and headers.

workaround. If you have two or more different printers on your system, you can quickly find out whether a printing problem stems from the printer driver by trying WINPRN on the other printer.

One problem I am aware of—and one for which I can offer no ready solution—is that some third-party, fixed-pitch TrueType fonts will not show up in the Options dialog box's Typeface list. In other cases, some third-party TrueType fonts that are not fixed-pitch will show up. The culprit? A bit in a data structure associated with TrueType fonts tells the system whether a particular font's pitch is fixed or variable. Unfortunately, the documentation for this bit in the Microsoft Windows SDK (Software Development Kit) is incorrect. According to the SDK, this bit, which is labeled TMPF_FIXED_PITCH, should be set to 1 for fixed-pitch fonts and 0 for variable-pitch fonts. Makes sense, right? But fixed-pitch Microsoft TrueType fonts set this bit to 0, and variable-pitch Microsoft TrueType fonts set it to 1—just the opposite of what the documentation says. This documentation error is noted in a Microsoft KnowledgeBase article (Q86834), but some third-party TrueType font vendors apparently aren't aware of it. They do as the documentation says, and their fonts make life difficult for programs that discriminate between variable-pitch and fixed-pitch fonts.

WINPRN'S SOURCE CODE WINPRN was written in C and can be compiled with either the Microsoft or the Borland C/C++ compilers. To compile with Microsoft C/C++, use the make file WINPRN. To compile with Borland C++, use WINPRN.BOR. The main source code file, WINPRN.C, is more than 2,000 lines long, so we can't discuss all of it in this article. Instead we'll focus on two of WINPRN's most interesting aspects: how it interfaces with the printer and how it turns the page on its side when printing in two-page-per-sheet landscape mode (trivial in DOS but a real trick in Windows!). From this, you'll learn a lot about Windows printing in general. Other interesting portions of the program that you may care to examine on your own include the code that supports the owner-drawn Print button, the code that determines what fixed-pitch fonts are available when WINPRN is started, the code that supports drag-

and-drop files, and the PrintPage function, which outputs one page of text read from the file to the printer.

NO GUTS, NO GLORY Windows printing is a complex subject that could easily fill the pages of a small- to medium-size book. It got a full chapter in Charles Petzold's classic *Programming Windows* (Microsoft Press, 1992) and could easily have merited more. I'll try to do the topic justice here by providing a brief description of the process, accompanied by some sample code from WINPRN. Additional information is available in the Microsoft Windows SDK, chapter 15 of *Programming Windows*, and chapter 5 of Jeffrey Richter's *Windows 3.1: A Developer's Guide* (M & T Publishing, 1992).

To begin our discussion, let's contrast the DOS and Windows processes to output a simple line of text to the printed page. In DOS, it's fairly simple. Once the printer port is known, a simple interrupt 17h function call to the system BIOS outputs a character to the printer. A string of characters can be output by calling interrupt 17h repeatedly. As an alternative, a DOS program can output characters to the PRN device by using DOS function 05h or other DOS output functions.

Of course, simplicity has a price. There is no choice of fonts: The printer will use the current font, whatever that happens to be. And an act as simple as ejecting the page after the text is output is complicated by the fact that although most printers recognize an ASCII 0Ch character as a command to eject the page, some do not. Therefore, in order to work with all printers, the program must use a printer driver or incorporate printer-specific logic in some other manner. Still, the point remains that it's not difficult for a DOS program to incorporate minimal printing capabilities.

In Windows, there is no easy way out. You either em-

brace the Windows printing model fully or don't use it at all. The advantage of using it is that the output is device independent, and you can rather easily incorporate fonts and graphics as well as text. The disadvantage is that the print logic is downright convoluted. Once you get it working, you hesitate to change anything for fear of breaking it. And you always have this nagging feeling that you might have overlooked something.

Here are the steps that a typical Windows program would follow to output a line of text to the printer:

1. Call GetProfileString() to retrieve the device= statement specifying the default printer from the [windows] section of WIN.INI. Parse the text to the right of the equal sign to determine the printer name, printer-driver name, and port assignment.
2. Using the information obtained in the first step, call Windows' CreateDC() function to create a printer device context.
3. Initialize the printer device context. This might include, for example, creating a logical font—a set of parameters describing such attributes as typeface and font height—and selecting it into the device context or setting the device context's mapping mode, which tells Windows what units you'll be using for GDI output.
4. Fill in the fields of a DOCINFO structure and call the StartDoc() function to begin the print job. In Windows 3.1, StartDoc() replaces the STARTDOC

printer escape used in earlier versions. Other escape sequences were also replaced with standalone functions. Since it's a Windows 3.1 utility, WINPRN uses the modern printer-control functions instead of the equivalent escape sequences.

5. Call Windows' StartPage() function to signal the start of a new page.

6. Use GDI's DrawText() or TextOut() function to output the line of text to the printer using the printer-device context.

7. Call EndPage() to tell Windows that this page is finished and to eject it from the printer.

8. Call EndDoc() to end the print job formally.

9. Delete the printer device context.

And that's only the beginning. This scenario is simplistic to the point of being unrealistic, because a Windows program that's doing real printing (that is, outputting more than one line of text and graphics) should present a dialog box enabling the user to cancel the print job before it finishes. This is important for long print jobs and critically important if the user is printing straight to the printer port (not through Print Manager). In addition, the program should check for error returns from the various printing functions and react appropriately. It is particularly important to check for error returns from EndPage(), because this is where your program finds out (among other things) that Print Manager ran out of memory or disk

space. Sometimes Windows reports these errors for you; other times, it's up to your program to report the errors—more on this subject in a moment.

The point to take home from all this is that Windows printing is very much unlike DOS printing but is vastly more powerful. Look at step 6 in the above procedure. You can call any GDI drawing function at this point in the program, and Win-

Common WINPRN Error Messages

Error message	Cause and solution
Unable to create a device context	Most likely, the device= statement specifying the default printer has been removed from the [windows] section of WIN.INI. Use Control Panel to select a default printer.
There must be at least one fixed-pitch TrueType font installed for WINPRN to work. If you removed the Courier New font that came with Windows, reinstall it and start WINPRN again.	You have no fixed-pitch TrueType fonts installed. (WINPRN uses only fixed-pitch TrueType fonts.) Use Control Panel to install one or more fixed-pitch TrueType fonts. The Courier New font that comes with Windows 3.1 is a fixed-pitch TrueType font.
Unable to open filename	The file whose name is displayed at the bottom of the WINPRN window is no longer valid, probably because it was moved or deleted. Restore the file or pick another one to print.
Error reading filename	A disk error occurred when WINPRN attempted to read the file. This might indicate that the disk itself is damaged.
There is not enough memory to print the file	Windows is critically short of free memory, and WINPRN can not acquire the print memory it needs to print the file. Close some open application programs and try to print again.
Unable to set the paper	The printer device driver does not support the function call that enables WINPRN orientation to specify portrait or landscape mode, the printer device driver could not be loaded (perhaps because it has been deleted from your hard disk), or the printer does not support landscape printing. Reinstall the printer. If WINPRN still does not work, and if an updated printer driver is available, install the newer driver and try again. This error message may also appear if the device= statement specifying the default printer has been removed from the [windows] section of WIN.INI. See "Unable to create a device context for the default printer" above.

Figure 3: This table shows common error messages from WINPRN and what to do about them.

dows will obligingly render the results on the printer. A DOS program can easily print a line of text but would have difficulty drawing a circle on the printed page. By contrast, in Windows a single function outputs a line of text or draws a circle on the page. With a few exceptions, any GDI function that works on the screen also works on the printer. Now that's device independence!

PRINTING BY EXAMPLE To see how WINPRN handles printing, let's analyze WINPRN's `PrintFile()` function, which accepts a window handle, an instance handle, and a pointer to a null-terminated filename and transmits the specified file to the printer in the currently selected format—that is, one page, two pages, or four pages per sheet. The full source code for the `PrintFile()` function is too long to print here, but as mentioned above, it is available from PC MagNet.

`PrintFile()` begins by calling Windows' `_lopen()` function to open the file and `_lseek()` to determine the file's size. The file-size information is used later to determine when printing is complete; `PrintFile()` counts the number of bytes it processes, and when the number of bytes processed equals the file size, `PrintFile()` ends the print job.

Next, `PrintFile()` allocates a 16K memory block from the global heap to serve as the file I/O buffer. Files are read and processed in 16K chunks in order to keep WINPRN's memory requirements low.

Now the action begins. `PrintFile()` calls WINPRN's `BuildDevMode()` function to create and initialize a `DEVMODE` structure, which specifies print options such as paper size and orientation (more on this in the next section). Then `PrintFile()` calls another local function named `CreatePrinterDC()` to create a printer device context for the default printer. `CreatePrinterDC()` takes the `DEVMODE` structure created by `BuildDevMode()` as input. In code, this sequence looks like this:

```
if ((npDevMode = BuildDevMode (hwnd,
    pl[nLayout].nOrientation)) ==
    NULL) {
    .
    .
    .
    return IDERR_DEVMODEFAILED;
}
```

```
}
if ((hdcPrn = CreatePrinterDC
    (npDevMode)) == NULL) {
    .
    .
    .
    return IDERR_CREATEPRINTERDC-
        FAILED;
}
LocalFree ((HLOCAL) npDevMode);
```

If either function fails, an error message is displayed and `PrintFile()` returns an error code to the caller. If both succeed, `PrintFile()` calls `LocalFree()` to free the local memory holding the `DEVMODE` structure. `BuildDevMode()` allocates the memory block, but it is the caller's responsibility to deallocate the block.

With a printer-device-context handle now in hand, `PrintFile()` initializes the device context by setting the mapping mode to `MM_TWIPS` with the statement

```
SetMapMode (hdcPrn, MM_TWIPS);
```

A twip is equal to 1/20th of a point, or 1/1440th of an inch. `MM_TWIPS` is a convenient mode for us to work in, because most of WINPRN's page measurements are based on font size. Fonts are measured in points, and twips convert easily to points. In addition, Windows printer drivers are written so that 1 logical twip equals 1/1440 inch on the printed page.

`PrintFile()` then creates a logical font using the typeface name selected in the Options dialog box and selects that font into the device context with these statements:

```
memset (&lf, 0, sizeof (lf));
strcpy (lf.lfFaceName,
    aszFaces[nCurrentFont]);
lf.lfHeight = pl[nLayout]
    .nCharHeight;
lf.lfOutPrecision = OUT_TT_ONLY-
    _PRECIS;

if ((hFont = CreateFontIndirect
    ((LPLOGFONT) &lf)) == NULL) {
    .
    .
    .
    return IDERR_CREATEFONT-
        INDIRECTFAILED;
}
hOldFont = SelectObject (hdcPrn,
```

```
hFont);
```

The font height is obtained from the global `pl` (page layout) array, which stores all the font and page metric information used in WINPRN's page layouts. Setting the `lfOutPrecision` member of the `LOGFONT` structure to `OUT_TT_ONLY- _PRECIS` ensures that only TrueType fonts will be selected. If all has gone well, the printer device context now has the appropriate font selected, and `hOldFont` contains the handle of the device context's default font. Later, before deleting the device context, `PrintFile()` reselects the default font; that's why the handle is saved in a variable.

Next, `PrintFile()` calls Windows' `GetOutlineTextMetric()` function to return information about the font that was just selected into the device context and to determine how many characters will fit on each line. In code, it looks like this:

```
nSize = GetOutlineTextMetrics
    (hdcPrn, 0, NULL);

// Fix a bug in LaserJet IV drivers,
// which return 0 in the previous
// statement
if (nSize == 0) nSize = 512;
if ((npOtm = (OUTLINETEXTMETRIC NEAR
    *) LocalAlloc (LMEM_FIXED,
    nSize)) == NULL) {
    .
    .
    .
    return IDERR_LOCALALLOCFAILED;
}
GetOutlineTextMetrics (hdcPrn,
    nSize, npOtm);
nCharWidth = (npOtm->otmTextMetrics)
    .tmAveCharWidth;
nCharsPerLine = pl[nLayout]
    .nPageWidth / nCharWidth;
LocalFree ((HLOCAL) npOtm);
```

Prior to calling `GetOutlineTextMetrics()` to return font metric data, `PrintFile()` calls `GetOutlineTextMetrics()` with a `NULL` third parameter to learn how much memory the subsequent call will require. At least one HP LaserJet 4 printer driver with which WINPRN was tested returned 0 to this call (a bug in the printer driver), so I added code to set `nSize` to 512 if the initial call to `GetOutlineTextMetrics` returns 0. The normal return from this function call is less than 200, so 512 should

be more than enough now and in future versions of Windows, I hope. The number of characters per line is computed by dividing the page width stored in the `pl` array by the `tmAveCharWidth` value returned by `GetOutlineTextMetrics()`. All values are in twips.

`PrintFile()` is now almost ready to begin printing. First, it disables its own window to prevent further input from the user. (Think how messy things could get if the user could start a new print job while in the midst of another.) It then sets the global variable `bAbort` to `FALSE`, displays a print-status dialog box called `Printing` (which gives the name of the file that is currently printing, the page number, and a cancel button), and registers an abort procedure:

```
EnableWindow (hwnd, FALSE);

bAbort = FALSE;
lpfnPrintDlgProc = MakeProcInstance
(PrintDlgProc, hInstance);
hwndPrintDlg = CreateDialog
(hInstance, "PrintStatus", hwnd,
lpfnPrintDlgProc);

lpfnAbortProc = MakeProcInstance
(AbortProc, hInstance);
SetAbortProc (hdcPrn,
lpfnAbortProc);
```

An abort procedure is an exported function that Windows calls repeatedly while printing. It is registered with the `SetAbortProc()` function and prototyped in the following way:

```
BOOL CALLBACK AbortProc (HDC hdc, int
error)
```

If printing is proceeding smoothly, and there are no errors to report, the error parameter is equal to 0 when `AbortProc()` is called. The other possible value is `SP_OUTOFDISK`, which indicates that although Print Manager is out of disk space, the necessary disk space could be made available if Print Manager could regain control and transfer some of the spooled file to the printer.

WINPRN's `AbortProc()`, uses a simple `PeekMessage` loop to retrieve and dispatch messages waiting in WINPRN's message queue and to give Print Manager

a slice of the CPU time:

```
while (!bAbort && PeekMessage (&msg,
NULL, 0, 0, PM_REMOVE))
if ((hwndPrintDlg == 0) ||
!(IsDialogMessage
(hwndPrintDlg, &msg)))
DispatchMessage (&msg);
return !bAbort;
```

Once Print Manager has freed up some disk space, printing can continue.

Notice that `AbortProc()` ends with

```
return !bAbort;
```

This is important. The value returned from the abort procedure determines whether Windows will continue printing. A nonzero value allows the print job to continue; 0 cancels it. `bAbort` is `FALSE` (0) initially, so `AbortProc` will always return nonzero (and printing will continue) unless something sets `bAbort` to `TRUE`. If you look at the dialog box procedure `PrintDlgProc`, which services the `Printing` dialog box, you'll see when and how this happens. If the user clicks the dialog box's Cancel button, the following statements are executed:

```
bAbort = TRUE;
EnableWindow (GetWindow (hwnd,
GW_OWNER), TRUE);
DestroyWindow (hwnd);
hwndPrintDlg = 0;
return TRUE;
```

Right away, `bAbort` gets set to `TRUE`. The next time Windows calls `AbortProc()`, `AbortProc()` will return `FALSE` and printing will be canceled. Therefore, printing stops if the user clicks the Cancel button in the `Printing` dialog box.

Printing is finally ready to begin. `PrintFile()` calls `StartDoc()` to begin the print job. It then enters a `while` loop that reads and processes the file one character at a time, ending only when the print job is aborted or the final character is processed. The GDI calls that draw on each sheet of paper are sandwiched between calls to `StartPage()` and `EndPage()`. Prior to the `EndPage()` call, GDI calls are merely buffered in a metafile.

It is during the execution of `EndPage()` that most of the processing takes place. It is also during the `EndPage()` call that

printing errors are reported. If Print Manager is out of disk space, for example, and doesn't anticipate more disk space becoming available, your program learns of this from the `EndPage()` return code. A return code that is greater than or equal to 0 means `EndPage()` succeeded; a negative value indicates that an error occurred. The value itself specifies the nature of the error. `PrintFile()` handles error returns from `EndPage()` in the following manner:

```
nResult = EndPage (hdcPrn);
if (nResult < 0) {
if (hwndPrintDlg != 0) {
EnableWindow (hwnd, TRUE);
DestroyWindow (hwndPrintDlg);
}
AbortDoc (hdcPrn);
.
.
.
_lclose (hFile);

if ((nResult & SP_NOTREPORTED)
&& ((nResult == SP_OUTOFDISK)
|| (nResult == SP_OUTOFMEMORY)))
MessageBox (hwnd, szError
[IDERR_ENDPAGEFAILED],
szError[IDERR_TITLE],
MB_ICONINFORMATION | MB_OK);
return IDERR_ENDPAGEFAILED;
}
```

If `EndPage()` returns a negative value, `PrintFile()` prepares for shutdown by closing down the `Printing` dialog box, calling `AbortDoc()` to abort the print job, and performing other housekeeping chores such as closing the file. Then, if the error was `SP_OUTOFDISK` or `SP_OUTOFMEMORY` (indicating a disk space or memory shortage) and has not already been reported to the user by Windows, `PrintFile()` displays a message box with an error message. In most cases, Windows reports the error through a message box of its own, and your program doesn't have to do anything. Windows informs you if it hasn't reported the error by setting the `SP_NOTREPORTED` bit in `EndPage`'s return code. `PrintFile()` ignores other `EndPage()` error codes, including `SP_APPABORT`, which indicates that the abort procedure canceled the print job by returning 0, and `SP_USERABORT`, which indicates that the user canceled the print job using Print Manager.


```

/*
 * BuildDevMode builds a DEVMODE structure for the default printer.
 *
 * Input parameters:
 *
 *   hwnd = Window handle
 *   nOrientation = Desired paper orientation (0=Portrait,
 *   1=Landscape)
 *
 * Returns:
 *
 *   Pointer to an initialized DEVMODE structure if the function
 *   succeeds;
 *   NULL if it fails
 *
 * Note:
 *
 *   It is the caller's responsibility to free the local memory block
 *   allocated to hold the DEVMODE structure.
 */

NPDEVMODE BuildDevMode (HWND hwnd, int nOrientation)
{
    HINSTANCE hLib;
    LPFNDEVMODE lpfnEDM;
    char szBuffer[128], szDriver[80];
    char *szPrinterName, *szPort, *szTmp;
    NPDEVMODE npDevMode;
    int nSize, i;

    //
    // Read the default printer parameters from the [windows] section
    // of WIN.INI.
    //
    if (!GetProfileString ("windows", "device", "", szBuffer,
        sizeof (szBuffer)))
        return NULL;

    szPrinterName = szBuffer;

    i = 0;
    while (szBuffer[i++] != 0x2C);
    szTmp = &szBuffer[i];
    szBuffer[i - 1] = 0;

    while (szBuffer[i++] != 0x2C);
    szPort = &szBuffer[i];
    szBuffer[i - 1] = 0;

    lstrcpy (szDriver, szTmp);
    lstrcat (szDriver, ".DRV");

    //
    // Load the printer driver and get the address of the ExtDeviceMode
    // function. Return NULL if the driver does not support
    // ExtDeviceMode.
    //
    if ((hLib = LoadLibrary (szDriver)) < HINSTANCE_ERROR)
        return NULL;

    if ((lpfnEDM = (LPFNDEVMODE) GetProcAddress (hLib,
        "ExtDeviceMode")) == NULL) {
        FreeLibrary (hLib);
        return NULL;
    }

    //
    // Call ExtDeviceMode once to determine the size of the DEVMODE
    // structure. Then allocate a local memory block large enough to
    // hold the structure and call ExtDeviceMode a second time to fill
    // it in.
    //
    if ((nSize = (*lpfnEDM) (hwnd, (HMODULE) hLib, NULL, szPrinterName,
        szPort, NULL, NULL, 0)) < 0) {
        FreeLibrary (hLib);
        return NULL;
    }

    if ((npDevMode = (NPDEVMODE) LocalAlloc (LMEM_FIXED, nSize)) ==
        NULL) {
        FreeLibrary (hLib);
        return NULL;
    }

    if ((*lpfnEDM) (hwnd, (HMODULE) hLib, npDevMode, szPrinterName,
        szPort,
        NULL, NULL, DM_OUT_BUFFER) < 0) {
        LocalFree ((HLOCAL) npDevMode);
        FreeLibrary (hLib);
        return NULL;
    }

    //
    // Call ExtDeviceMode a third time to modify DEVMODE's
    // dmOrientation field.
    //
    npDevMode->dmFields = DM_ORIENTATION;
    npDevMode->dmOrientation = (nOrientation == 0) ? DMORIENT_PORTRAIT:
        DMORIENT_LANDSCAPE;

    if ((*lpfnEDM) (hwnd, hLib, npDevMode, szPrinterName, szPort,
        npDevMode,
        NULL, DM_IN_BUFFER | DM_OUT_BUFFER) < 0) {
        LocalFree ((HLOCAL) npDevMode);
        FreeLibrary (hLib);
        return NULL;
    }

    FreeLibrary (hLib);
    return npDevMode;
}

```

Figure 5: BuildDevMode() creates and initializes a DEVMODE structure specifying print options such as paper size and orientation.

When printing finishes and the while loop falls through, PrintFile() formally ends the print job by calling Windows' EndDoc() function, which is the complement to StartDoc(). It then cleans up after itself by reenabling the WINPRN window, killing the Printing dialog box, closing the file, deleting the printer device context, and so on. Finally, it returns 0 to signify successful completion.

SETTING THE PAPER ORIENTATION

The previous section briefly mentioned the DEVMODE structure, which PrintFile() creates by placing a call to the WINPRN's BuildDevMode() function. DEVMODE is a rather lengthy data structure that defines printer settings such as paper size, paper orientation, and number of copies. It is defined as follows in PRINT.H:

```

char    dmDeviceName[CCHDEVICENAME];
UINT    dmSpecVersion;
UINT    dmDriverVersion;
UINT    dmSize;
UINT    dmDriverExtra;
DWORD   dmFields;
int      dmOrientation;
int      dmPaperSize;
int      dmPaperLength;
int      dmPaperWidth;
int      dmScale;
int      dmCopies;
int      dmDefaultSource;
int      dmPrintQuality;
int      dmColor;
int      dmDuplex;
int      dmYResolution;
int      dmTTOption;
) DEVMODE;

```

In a DOS program, changing to portrait or landscape mode is relatively easy, involv-

ing little more than transmitting a few bytes out the printer port. In Windows, this change is much more complicated. The paper orientation is specified in the dmOrientation field of the DEVMODE structure.

When an application creates a printer device context, it has the option of specifying printer settings by passing a pointer to a DEVMODE structure as the fourth parameter to CreateDC(). A NULL pointer tells CreateDC() to use the printer driver's default settings. Setting the dmOrientation field of a DEVMODE field passed to CreateDC() equal to DMORIENT_LANDSCAPE selects landscape printing mode; setting this field to DMORIENT_PORTRAIT selects portrait mode.

Sounds easy so far. So what's the catch? The catch is correctly filling in the rest of the DEVMODE structure's fields—a job that only the printer driver can do. And calling the printer driver requires no small

```

typedef struct tagDEVMODE
{

```

amount of effort. Here's what it involves:

1. If you know the printer name but do not know the driver name and port name, retrieve them from WIN.INI.

2. Use Windows' LoadLibrary() function to load the printer driver (which is actually a DLL) into memory.

3. Use GetProcAddress() to get the address of the driver's ExtDeviceMode() function.

4. Call ExtDeviceMode() to determine how many bytes of information the driver will return when you ask it for a DEVMODE structure. Some drivers append private data to the structure, so it's not advisable to use sizeof (DEVMODE). Then allocate a memory block large enough to hold the data.

5. Call ExtDeviceMode() a second time to copy the printer's default DEVMODE structure to the memory block allocated in the previous step.

Once you have the DEVMODE structure in hand, you're still not done. You must call ExtDeviceMode() again and let the printer driver modify its own record of the printer settings. The modified structure that ExtDeviceMode() copied to the caller's buffer can then be passed to CreateDC().

This process is further complicated by the facts that a few printer drivers don't support ExtDeviceMode() and that the ExtDeviceMode() function is poorly documented in the Microsoft Windows SDK. According to Jeffrey Richter's book, the only Windows 3.1 printer driver that doesn't support ExtDeviceMode() is HPPLLOT.DRV. You'll know if ExtDeviceMode() is not supported, because the call to GetProcAddress() in step 3 will return NULL.

Enough background; let's look at some code. Specifically, let's see how WINPRN sets the paper orientation prior to printing. The bulk of the work is done by WINPRN's BuildDevMode() function, which fills in a DEVMODE structure for the default printer and sets the dmOrientation field to either DMORIENT_PORTRAIT or DMORIENT_LANDSCAPE. A pointer to this modified DEVMODE structure is then passed to CreatePrinterDC(), which in turn passes the pointer to Windows' CreateDC() function. The source code for BuildDevMode() is shown in Figure 5.

BuildDevMode() starts off by retrieving information about the default printer, (including the printer, driver, and port

names), from the [windows] section of WIN.INI. The driver name is copied to the buffer specified by szDriver, and .DRV is appended in order to form a complete filename. Then LoadLibrary() is called to load the driver, followed by a call to GetProcAddress() to get the address of ExtDeviceMode():

```
if ((hLib = LoadLibrary (szDriver))
    < HINSTANCE_ERROR) return NULL;

if ((lpfnEDM = (LPFNDEVMODE)
    GetProcAddress (hLib,
    "ExtDeviceMode")) ==
    NULL) {
    FreeLibrary (hLib);
    return NULL;
}
```

A NULL return from BuildDevMode() indicates that an error occurred, prompting the caller—WINPRN's PrintFile() function—to display an error message.

Next, BuildDevMode() calls ExtDeviceMode() to determine how much memory is needed in order to hold DEVMODE information returned by the printer driver. Setting ExtDeviceMode()'s final parameter to 0 specifies that we want size information; the value returned from ExtDeviceMode() specifies the required memory size in bytes. Once it determines memory requirements, BuildDevMode() allocates a local memory block:

```
if ((nSize = (*lpfnEDM) (hwnd,
    (HMODULE) hLib, NULL,
    szPrinterName, szPort, NULL,
    NULL, 0)) < 0) {
    FreeLibrary (hLib);
    return NULL;
}

if ((npDevMode = (NPDEVMODE)
    LocalAlloc (LMEM_FIXED,
    nSize)) == NULL) {
    FreeLibrary (hLib);
    return NULL;
}
```

If all has gone well so far, BuildDevMode() now calls ExtDeviceMode() with the third parameter holding a pointer to the memory block and the final parameter equal to DM_OUT_BUFFER, which instructs the printer driver to copy DEVMODE information to the location spec-

ified by the pointer:

```
if ((*lpfnEDM) (hwnd, (HMODULE)
    hLib, npDevMode, szPrinterName,
    szPort, NULL, NULL,
    DM_OUT_BUFFER) < 0) {
    LocalFree ((HLOCAL) npDevMode);
    FreeLibrary (hLib);
    return NULL;
}
```

Finally, BuildDevMode() calls ExtDeviceMode() again with both the DM_IN_BUFFER and the DM_OUT_BUFFER bits set in the final parameter to set dmOrientation to the desired value:

```
npDevMode->dmFields=DM_ORIENTATION;
npDevMode->dmOrientation =
    (nOrientation == 0) ?
    DMORIENT_PORTRAIT :
    DMORIENT_LANDSCAPE;

if ((*lpfnEDM) (hwnd, hLib,
    npDevMode, szPrinterName,
    szPort, npDevMode, NULL,
    DM_IN_BUFFER | DM_OUT_BUFFER) <
    0) {
    LocalFree ((HLOCAL) npDevMode);
    FreeLibrary (hLib);
    return NULL;
}
```

When called in this manner, the value in the DEVMODE structure's dmFields field specifies which fields we wish to change. BuildDevMode() modifies only the dmOrientation field, so it sets dmFields to DM_ORIENTATION. The value placed in the dmOrientation field before the call specifies what we want the print driver to copy to the dmOrientation field. When this call to ExtDeviceMode() returns, we finally have a complete DEVMODE structure, and the dmOrientation field has been modified to match the currently selected page layout. BuildDevMode() finishes by calling FreeLibrary() to counter the earlier call to LoadLibrary(). It then returns the address of the initialized DEVMODE structure.

ENHANCING WINPRN You could easily modify the BuildDevMode() structure to initialize printer settings in addition to the paper orientation. Just add code to modify other fields in the DEVMODE structure and add calling parameters to support them (supplementing the nOrien-

tation parameter that BuildDevMode() currently accepts). This gives you a routine that you could use in any application.

For you enterprising programmers out there, here's a suggested enhancement that you might find useful. First, modify BuildDevMode() so that it accepts a fourth parameter—`nPaperSize`—that the caller sets to either `DMPAPER_LETTER` (to select 8.5- by 11-inch paper) or

`DMPAPER_LEGAL` (for 8.5- by 14-inch paper). BuildDevMode() would set the `dmPaperSize` field of the `DEVMODE` structure accordingly, so `PrintFile()`'s call to `CreatePrinterDC()` would specify the paper size as well as the paper orientation. With this foundation in place, you could add another page-layout option to WINPRN—one that turns a legal-size page on its side and prints three pages to a sheet.

New page layouts are relatively easy to add, because all the numbers defining the layouts—page orientation, number of pages per sheet, desired font height, and so on—are stored in the global `p1` array, whose format is documented in the source code file `WINPRN.C`. Think about it! □

JEFF PROSISE IS A CONTRIBUTING EDITOR OF PC MAGAZINE.

GUIDE TO OUR UTILITIES & HOW TO GET THEM

WINPRN

PURPOSE: Relying on the scalability of TrueType fonts in Microsoft Windows 3.1, WINPRN lets you print one, two, or four pages on one sheet of paper. Files can be selected through a dialog box or by drag-and-drop from File Manager.

SETUP: Installing WINPRN is simple. Just copy WINPRN.EXE to your hard disk and use Program Manager to create an icon for it under Windows.

When you launch WINPRN by double-clicking on its icon, you will be presented with a dialog box that allows you to choose the number of pages to print per sheet, select files for printing, and set options. You can also select multiple files at once by dragging them from File Manager and dropping them over the WinPrn icon.

The Options dialog box lets you select the typeface and tab length (in spaces). You can also select whether to print a box around each page and whether to print page headers. The header consists of the current date, the filename, and a page number. WINPRN options are stored in an .INI file located in the same directory as WINPRN.EXE.

Files are printed by clicking on the big button labeled with a picture of a printer. You can abort printing by clicking on the Cancel button in the Printing window.

REMARKS: To use WINPRN, your computer must be running Microsoft Windows 3.1 and must have a fixed-pitch TrueType font, such as Courier New (which ships with Windows 3.1), installed. If either of these are missing from your system, you will not be able to run WINPRN.

WINPRN's font-selection dialog box lists all the fixed-pitch fonts on your system. Occasionally, due to an error in Microsoft's documentation of how to tag fixed-pitch files, third-party fonts that are not fixed pitch may appear in WINPRN's list box, and some fixed-pitch fonts may be missing from the list box. Unfortunately, there is no workaround for this problem.

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PC Solutions

TIPS AND TECHNIQUES TO INCREASE YOUR PRODUCTIVITY

HARDWARE

Lost Label Update

TIP In the June 15, 1993, Peripherals section of Solutions, you provided tips on removing lost printer labels. I prefer to use the adhesive pads that doctors use for removing bandages. They are very effective and leave little residue, since the solvent is designed to evaporate entirely.

Bradley A. Lowry
via fax

PC MAGAZINE: There are probably only two kinds of people who print adhesive labels in their printers: those who have had one get stuck inside the printer, and those who will have it happen to them eventually. This tip is an excellent suggestion, since removing the label adhesive without leaving any residue is the main objective. The oils mentioned in the original tip still leave a bit of a film behind, so these pads would be an improvement. Since most of us don't have dispensaries in our dens or offices, you might want to ask your doctor for a couple of pads next time you're in for a checkup. If you use adhesive labels in a printer, a few pads in your printer's emergency supply kit might save the day.—*Alfred Poor*

Upgrade or Replace?

Q I have an IBM PC AT with an 80286 processor and have upgraded a number of the system components over the years. I've recently seen advertisements for products that can turn my machine into a 486. Can these upgrades really do everything the ads say they can?

John J. Brady
Houston, Texas

PC MAGAZINE: Although many ATs have long since been relegated to such relatively undemanding tasks as word processing or mooring small boats, we receive a surprising number of upgrade questions, especially about 486-processor replacements. By and large, these upgrades do what they promise but may still end up disappointing you.

The first thing to understand is that there is a wide range of abilities among the various processors that bear the digits 486 in their part numbers. Intel's 80486DX is a 32-bit processor with a 32-bit data bus, a floating-point math coprocessor, and an 8K system cache built into the chip. Compared with your 16-bit 80286 with a 16-bit data bus, no cache, and no floating-point help, the Intel chip looks like a terrific improvement even before you begin to factor in the CPU's clock-speed ratings.

Many of the upgrades for 80286 systems, however, don't use the Intel DX chip. Instead, they use Cyrix's or Texas Instruments' 486SLC chips, which have very different specifications. Although these chips use the same instruction set as the 486DX and are 32-bit processors, they, like the 286, have only a 16-bit data bus. They also have only a 1K system cache on the chip, and while they provide some acceleration for integer math oper-

ations, they do not do floating-point calculations.

The SLC upgrades often drive the CPU at double the existing system's clock speed. Since the IBM PC AT ran at either 6 MHz or 8 MHz, however, your upgraded system will run at only 12 MHz or 16 MHz. That's pretty slow by today's standards. (AT clones designed for 12-MHz or 16-MHz operation fare much better with this speed-doubling.)

And then there's the memory issue. The SLC chip can address only 16MB. This may seem like plenty, but many users are now installing more. Motherboards designed for 486DX CPUs can typically accept 32MB or 64MB of memory and use memory chips designed to operate at the full speed of the system.

The price of an SLC-based upgrade runs from about \$250 to \$400, depending on the manufacturer, model, and place of purchase. For this, you will get a performance increase of about 25 percent to 50 percent. While that may seem impressive, for less than \$200 you can buy a brand new motherboard with an 80486SX CPU (the same as the 80486DX but without the floating-point math feature) that will fit in your AT case and will involve only a little more installation effort than the CPU-only upgrade. Note, however, that the cost of the memory

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chips needed by a new 32-bit 486 motherboard is not always included in the listed price.

With a new motherboard, you will get the full 33-MHz clock speed and should more than double the performance of your original AT. You can find 486SX systems in a case with 1MB of memory, a new keyboard, a floppy disk drive, I/O ports, and more for about \$300. In that case, all you'll have to do is install your existing display adapter and hard disk, and you'll be ready to run with a nearly new system.

While the processor upgrades for older systems may look appealing, the sad truth is that you can get more performance for the same and sometimes less money by buying a new motherboard or a new system.—*Alfred Poor*

■ OPERATING ENVIRONMENTS

A Better DOS Prompt

❓ I have a Mitsuba laptop that has an 80286 chip and an 82C455 VGA BIOS. Because the machine has an LCD screen, I configure it in HERC mode for the best black-and-white contrast. The problem is that when the screen is full of data, it is

sometimes difficult to locate the DOS prompt.

This was also a problem on my IBM VGA desktop computer, but I was able to solve the problem using the PROMPT command and ANSI.SYS, as described in the January 14, 1992, Tutor column. I changed the prompt so it uses a magenta background color. My laptop, however, doesn't respond to similar commands. I would simply like to force the prompt (and only the prompt) to appear in reverse video. Can you tell me how to do this?

*Ross W. Campbell
Ann Arbor, Michigan*

HOW TO CONTACT US

Do you have a hardware, software, or systems problem you can't solve? Do you have a tip you think other readers could use? Or maybe you'd like a better understanding of how something works. If so, we invite you to let us know about it. Our experts can give you practical solutions to your problems, provide techniques for using your software and hardware more productively, and help you grasp computer concepts and understand the latest technology.

It's easy to contact us. Just send us your submission (use ASCII format for text files) via the medium that's most convenient for you:

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Our Advisors

Douglas Bolling is a contributing editor and the author of many utilities, including MBOOT.COM and EMS40.SYS.

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Ethan Winer is a contributing editor and the author of *PC Magazine BASIC Techniques and Utilities*.

► **PC MAGAZINE:** Most of the foreground/background color combinations you can set using ANSI commands will show up as a dim or bright white foreground on a black background on a monochrome monitor. Those that use a blue foreground will produce underlined text, and only the precise combination of white background and black foreground will give you reverse video. With a monochrome monitor, you're better off using the ANSI color command numbers that select general text attributes:

ESC[0m	Clear attributes
ESC[1m	Bold text
ESC[4m	Underlined text
ESC[5m	Blinking text
ESC[7m	Reverse video
ESC[8m	Concealed text

A PROMPT command to display just the DOS prompt in reverse video must set the reverse video attribute before displaying the prompt and clear all attributes afterward:

```
PROMPT $e[7m$P$g$e[0m
```

If you prefer a fancier prompt, replace the string \$P\$g in the command above with the prompt characters of your choice.

Here's my own favorite prompt for monochrome laptop screens:

```
PROMPT $e[0;7m$P$g$e[s
$e[H$e[K$d$e[;73H$e[=71
$t$e[=7h$e[0m$e[u
```

Of course, you must type this command all on one line. It starts by display-

ing the normal \$p\$g prompt in reverse video, then uses the \$e[s command to save the cursor position. The command \$e[H\$e[K\$d moves the cursor to the upper-left-hand corner of the screen, clears the entire top line in reverse video, and prints the date.

The command \$e[;73H positions the cursor in column 73 of line 1. Next comes a tricky command that's rarely used. The ANSI command \$e[=7l turns off the automatic wrapping of text at the right edge of the screen. The string \$t in the prompt gets replaced by the current time, including seconds and hundredths of seconds. Since line wrapping is disabled, however, the useless seconds and hundredths disappear. To finish up, the \$e[=7h command restores line wrapping, \$e[0m clears all attributes, and \$[u returns the cursor to the saved position. Give this prompt a try!—Neil J. Rubenking

You Can Go Home Again

❓ I'd like to create a batch file that stores the current directory in an environment variable so that it can be used to return to

```
@ECHO OFF
ECHO @PROMPT SET drv=$n:$_SET cd=$p>TEMP$$$1.BAT
COMMAND /C TEMP$$$1.BAT > TEMP$$$2.BAT
CALL TEMP$$$2.BAT
DEL TEMP$$$?.BAT
```

Figure 1: CURPATH.BAT stores the current drive and directory in environment variables so that they can be used to return to that drive and directory.

that directory. I tried redirection as a solution:

```
SET CURPATH => CURPATH.BAT
CD >> CURPATH.BAT
```

But that didn't work. It seems that there should be a simple way to accomplish this. Do you have any ideas?

*William J. Holab
Brooklyn, New York*

► **PC MAGAZINE:** The short batch file shown in Figure 1 will store the current directory and the current drive in environment variables named CD and DRV, respectively. To see how this batch file works, comment out the last line by

```
@PROMPT SET drv=$n:$_SET cd=$p
```

In the resulting prompt, \$n is replaced by the current drive, \$_ starts a new line, and \$p is replaced by the current directory.

CURPATH's next line executes this batch file under a secondary copy of COMMAND.COM, redirecting the output to TEMP\$\$\$2.BAT. Since the only command in TEMP\$\$\$1.BAT is one to set the prompt, TEMP\$\$\$2.BAT contains nothing but a copy of the prompt. As a side benefit, any changes to environment variables made in a batch file under a secondary command processor disappear when the batch file ends, so the original prompt is restored automatically.

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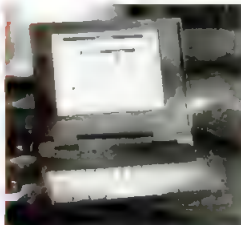
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TEMP\$\$\$2.BAT will look something like this:

```
SET drv=C:
SET cd=C:\SOLUTION\DOS
```

CURPATH.BAT executes this temporary batch file using CALL, not COMMAND /C, so the environment variables it sets remain active. The last line of CURPATH.BAT deletes the two temporary files.

You asked for a simple solution; CURPATH.BAT is short but not simple. Still, any time you need to store the current drive and directory in a batch file, you can call on CURPATH.BAT.

—Neil J. Rubenking

Changing Progman's Group Icons

❋I've been using Microsoft Windows 3.1 for several months now and like it a lot. But I've created so many program groups, which use the same dreary icon, that it's getting hard to recognize any groups individually. Is there any way to change group icons as you can change program item icons?

David P. Ferrell
Willowick, Ohio

►PC MAGAZINE: You can load PROGRAM.MAN.EXE into a resource editor and change the icon that's used for *all* group windows, but giving each group an individual icon requires some serious programming. Fortunately, that programming has been done for you. Plug-In for Program Manager, a \$20 shareware utility from Plannet Crafters, handles this task and much more. Plug-In was reviewed in First Looks in our issue of January 26, 1993.

Plug-In initially brightens up the default group icon with multiple colors and assigns special icons to the standard groups (for example, a coffee mug for the Startup group). After that, you can assign the icon of your choice to any group window. This is just one of the Program Manager enhancements provided by Plug-In; others include a history list for the File | Run command and the ability to disable groups temporarily. To get an evaluation

copy of this utility, download PLUG-IN.ZIP from ZiffNet's TIPS Forum, Library 14, ASP Shareware Utils or contact Plannet Crafters directly at 404-740-9821.—Neil J. Rubenking

WORD PROCESSING

Upgrading WordPerfect 5.1 Macros

❋TIP WordPerfect for DOS users who move from WordPerfect 5.1 to 6.0 may find that their converted macros run slower. One reason is that the translation program, MCV.EXE, automatically adds SAVESTATE, PERSISTALL, AutoCodePlacement(Off!), WP51CursorMovement(On!), and VARERRCHK(Off!) commands to the beginning of each macro it converts. WordPerfect must process all of these commands each time it runs the macro.

In many cases, some or all of these commands are not needed, so you can delete them to speed up the macro's operation. For example, VARERRCHK(Off!) tells WordPerfect to continue running a macro that contains undefined variables; PERSISTALL allows any variables in the macro to be recognized and used by other macros, functions, procedures, and merges during the current WordPerfect session. If there aren't any variables in your macro, you can delete both commands.

In the same vein, AutoCodePlacement(Off!) turns off the WordPerfect 6.0 Auto Code Placement

feature. You can delete the command if your macro doesn't enter any codes. WP51CursorMovement(On!) makes the cursor in WordPerfect 6.0 move as it does in 5.1. You can delete this command if your macro doesn't move the cursor. Finally, SAVESTATE saves the current state of certain features at the beginning of the macro and automatically returns to those values at the end of the macro. If you don't change those features in the macro, you can delete the SAVESTATE

command.

For macros that don't need any of these commands, deleting all five can yield a dramatic speed improvement, which is particularly welcome for macros you use frequently.

Caleb Murdock
Elmhurst, New York

►PC MAGAZINE: In my tests using assorted macros on a 486DX/25 system, the time saved was hardly noticeable except when I turned off turbo mode; even then I wouldn't call the improvement "dramatic." But the possibility remains that for some macros, the difference in speed may be significant.

More important, anyone who must translate a WordPerfect 5.1 macro to 6.0a needs to be aware of these commands and to understand the purpose of each. Mr. Murdock's description of the VARERRCHK(Off!) and PERSISTALL commands are reasonably complete. The other three could use more explanation.

WordPerfect 6.0a's Auto Code Placement feature is based on the premise that certain codes must always appear at the beginning of a paragraph or a page. To

WordPerfect 6.0a's Auto Code Placement feature is based on the premise that certain codes must always appear at the beginning of a paragraph or page.

center an entire paragraph, for example, you have to enter the [Just:Center] code at the start of the paragraph.

In WordPerfect 5.1, if you enter the code while in the middle of the paragraph (by pressing Shift-F8, then choosing Line | Justification | Center, and pressing the F7 key), WordPerfect

will start a new paragraph right at that location. In WordPerfect 6.0a, by contrast, if the Auto Code Placement feature is turned on, WordPerfect will move the center-justification code back to the beginning of the current paragraph rather than starting a new one.

If you're converting a WordPerfect 5.1 macro that expects the justification code to initiate a new paragraph, you'll want WordPerfect 6.0 to behave the same as 5.1. The AutoCodePlace-

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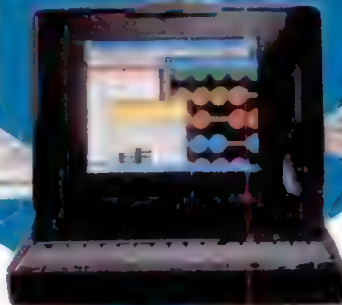
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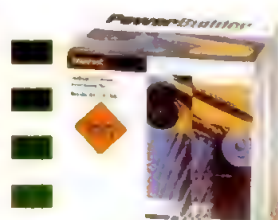
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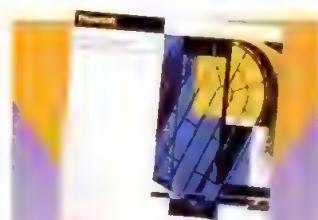
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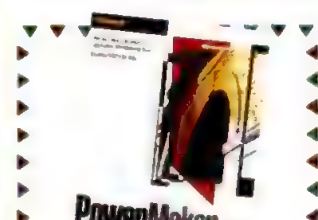
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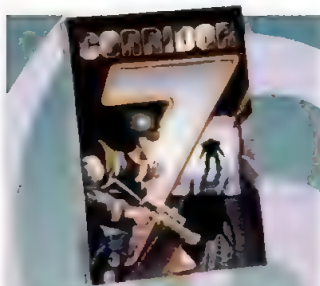
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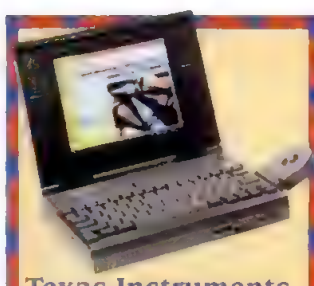
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ment(Off!) command ensures that it will. To turn the Auto Code Placement feature on or off manually in WordPerfect 6.0a, you can choose File | Setup | Environment and add or remove the X from the Auto Code Placement check box.

In much the same way, the WordPerfect 5.1 Cursor Movement option tells WordPerfect 6.0 to emulate 5.1's cursor movement. For example, suppose that you have a bold on code at the beginning of a line and that reveal codes is off. With the default WordPerfect 6.0 cursor movement, you won't be able to move the cursor to the left of the bolded code to type unbolded text at the beginning of the line. If you turn on the 5.1 cursor movement feature, however, you can move to the beginning of the bolded text, press the Left Arrow key once more to move to the left of the bold on code, and then enter unbolded text. (Note that even with default WordPerfect 6.0 cursor movement, you can move to the left of the bold code by first turning on the reveal-codes feature with Alt-F3.) To turn the option on or off manually, choose File | Setup | Environment, and then add or remove the X from the WordPerfect 5.1 Cursor Movement check box.

The SAVESTATE command stores (and later restores) the Auto Code Placement setting, the WP51 Cursor Movement setting, and the setting for confirming replacements in a search-and-replace operation. In general, if you don't need the AutoCodePlacement and WP51CursorMovement commands, you won't need the SAVESTATE command either.

Finally, if you take macro conversion seriously, there's one blind alley to avoid. If you choose Help, then Macros, and then Converting 5.1 macros, you'll find that the first paragraph in the help screen refers you to the file README.MCV in the WP60 directory for detailed information on macro conversion and error messages. However, you won't find a file of that name either in the WP60 directory or anywhere else on the distribution disks. WordPerfect confirms that as of this writing no such file exists, so there's no need to waste your time looking for it.

—M. David Stone

■ SPREADSHEETS

Odd Label Spacing

Ⓜ Some time ago I discovered that some of my Lotus 1-2-3, Release 2.3 and 2.4, worksheets exhibit unusual label-alignment behavior. In these particular .WK1 files, labels aligned with the flush-right prefix character (the double-quotation mark) spill out to the left of their cells if the labels are too wide to fit within the column. In all my other .WK1 files, such labels spill out to the right, as documented in the 1-2-3's user manual. Similarly, in these "abnormal" .WK1 files, over-wide centered labels spill out in both directions so that the label is centered on the midpoint of the column. Normally, these wide centered labels simply spill out to the right.

Why do I get this unusual label spacing with just these releases of 1-2-3? I don't want to fix it; I actually like it better than the normal behavior and would like to incorporate it in all my files. Can you help?

Kang Sam Hock
Singapore

►PC MAGAZINE: According to a Lotus spokesperson, your strangely behaving files must have been formatted with Allways, the formatting add-in shipped with 1-2-3, Release 2.2. The handling of over-wide labels you describe is normal in Allways.

Allways stores formatting information in files with the extension .ALL, much as the WYSIWYG add-in stores such information in .FMT files. If you use 1-2-3, Release 2.3 or 2.4, with WYSIWYG attached to read a .WK1 file that has an associated .ALL file, WYSIWYG preserves the Allways-style formatting information in a special (read "abnormal") type of .FMT file. You can't recreate this behavior in new .WK1 files with WYSIWYG attached, though. So if you prefer the Allways alignment, and you plan to stick with the DOS versions of 1-2-3, you'll need to go back to using Allways.

You can, however, enjoy flush-right labels that spill out to the left and centered labels that maintain their centering about column midpoints in 1-2-3 for Win-

dows. In fact, in 1-2-3 for Windows you can get whichever style of long-label treatment you prefer. Here there are tricks and traps to know about.

If you read any .WK1 file into 1-2-3 for Windows, the program makes all long labels overflow to the right, even if the .WK1 has a special Allways-style .FMT file associated with it. Similarly, if you create a new label by typing either the centered (caret) or the flush-right (double-quotation mark) label prefix, that label will overflow to the right if it's too wide to fit in its cell. However, by selecting a long label in a 1-2-3 for Windows document and clicking on the flush-right or on the centered Smarticon, you can make your label behave like one that was formatted with Allways. That's the trick.

The trap is that if you're a 1-2-3 for Windows user experienced in using DOS versions of 1-2-3, you may discover that some of your long labels behave like standard 1-2-3 2.x and 1-2-3 3.x labels, while others act like Allways-formatted labels. This can happen if you enter alignment prefixes for some of your labels and use Smarticon clicks for others. Those in which you explicitly enter a prefix will get normal alignment, and those for which you use Smarticons will behave like Allways labels. The solution is simple if you want all your labels to behave like Allways labels: Just select those labels that spill the wrong way and click the appropriate alignment icons. If you prefer Release 2.x and 3.x's behavior, stay away from the icon palette.—Craig Stinson

■ DATABASES

Printing Access Basic Code

►PC MAGAZINE: A number of Microsoft Access applications require custom code written in the Access Basic programming language. A complex application might involve a good many Access Basic modules, each containing a number of Access Basic functions and procedures. If you need hard-copy printouts of these routines to study, analyze, share with colleagues, or serve as program documentation, Code.Print Pro for Microsoft Access

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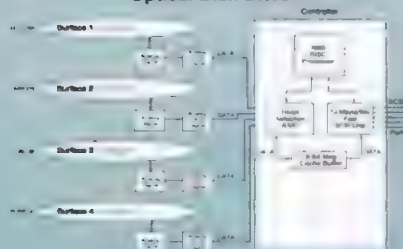
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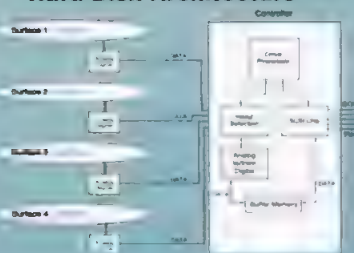
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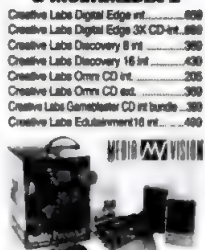
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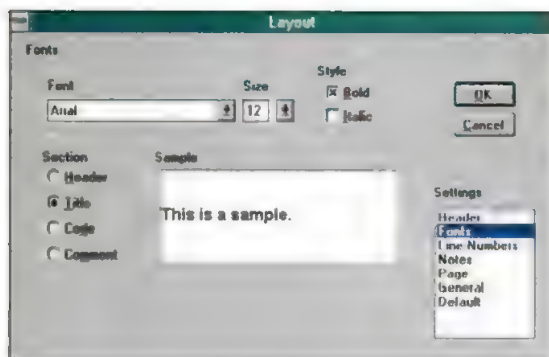


Figure 2: Code.Print Pro for Microsoft Access lets you choose a different font for each section of the printed page.

offers a flexible and convenient way to do the job.

With the Code.Print Pro utility, you can choose to print all or a selected number of your modules, functions, and procedures. An optional incremental-printing choice lets you print only those modules that have changed. Selected individual routines can be printed in any order, and you can save your choices (along with your layout options) to a print job file for reuse. The print job files can be collected into a special Code.Print Pro batch file (not a DOS batch file) for printing all at once or at a prescheduled time. This lets you schedule a long print run for overnight, for instance.

On every printed page, you can include a header that includes the module name, procedure name, date, time, or custom text that you specify, such as a project or client name. You can also include a footer with custom notes (perhaps a "Programmed by" or something like that).

Each page can have a title line after the header that specifies, for example, the name of the current routine and the module name. The beginning of each routine can be highlighted by printing the routine name in bold type. Indeed, you can specify a different font for each section on the page (Figure 2): one for the header, one for the title line, one for the source code, and one for comments that appear in the source code. The sample printouts in the documentation use 10-point Arial for headers, 12-point Arial for titles, 8-point Lucida Sans Typewriter for code, and 8-point Lucida Sans Typewriter Italic for comments—a

combination that produces rather attractive results. You can also add line numbers to the printout and optionally print an index at the end that lists the page number for each routine.

The product hooks into Microsoft Access so that when both are running and you choose Print from the Access File menu, Code.Print Pro's menu pops up. (This happens only when appropriate, as when a Module is the topmost window or you are viewing the Modules listing in a Container.)

Code.Print Pro is not perfect, of course. Unlike some other products of its genre, it does not indent your source code or cross-reference your variables. (The index includes only function and procedure names and so should not be confused with a variable cross-reference.) Moreover, a number of Code.Print Pro's dialogs lack the appropriate keyboard shortcuts (accelerator keys), making them cumbersome to navigate without a mouse. But for printing Access Basic source code, the product seems well worth the \$99 price.

The release I looked at works only with Microsoft Access, Version 1.0 or 1.1. By the time you read this, however, a version that works with Access 2.0 should be available. A version for Microsoft Visual Basic is also available.

Code.Print Pro for Microsoft Access can be obtained from Pinnacle Publishing (800-788-1900 or 206-251-1900).

—Sal Ricciardi

■ GRAPHICS

The Bleeding Edge

TIP I read "Creating Bleeds" in the September 28, 1993, Solutions column with great anticipation. I was disappointed to be told, however, that to make a bleed (where a portion of an image prints off the edge of the paper), I'd have to make the image smaller and then trim the page to produce the bleed. This solution is not acceptable, since the resulting page is no longer a standard size.

An alternative technique I've used

with considerable success takes advantage of the difference between European and American paper sizes. Because most laser printers accommodate both European and American paper sizes, you can trick the printer into producing a bleed at two edges of the paper (that is, either right and left or top and bottom).

American letter-size paper is 8.5 by 11 inches, while the European (in fact, most of the non-North American world) A4-size paper measures 8.27 by 11.69 inches. Most laser printers adjust the size of the printing field on the basis of the size of the paper, which is determined either by software controls or by sensors in the paper tray. By changing the software settings or taping over the appropriate sensors, you can, for example, use U.S. letter paper in the printer but print on an A4 field. This will produce a bleed in the process.

Lester A. Gimplerson
Brussels, Belgium

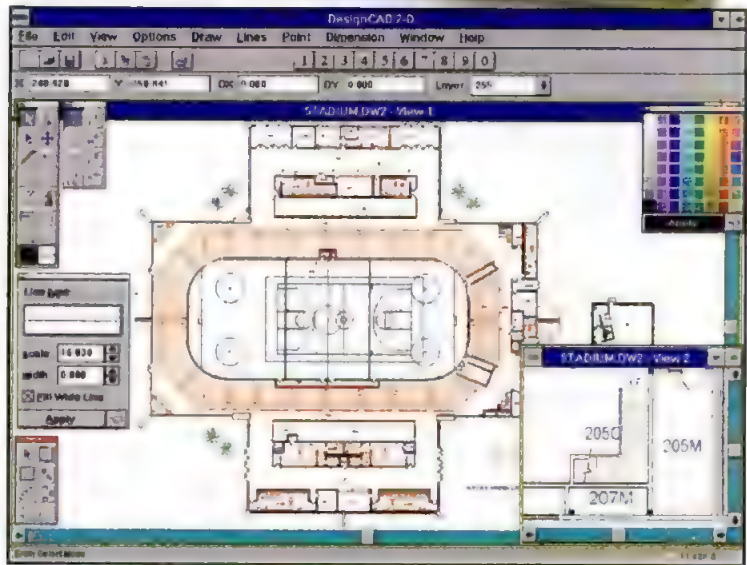
►PC MAGAZINE: You're absolutely right. It is indeed possible to create a bleed by designating a larger paper size (choosing legal-size paper works as well as choosing the A4 option), and then feeding a standard 8.5- by 11-inch sheet of paper to the printer.

Other users may not be able to duplicate Mr. Gimplerson's level of success, however. For example, some printers grip the paper along the sides or the top, making it impossible to bleed off that edge. In my tests, I found this technique worked most consistently when bleeding a design off the bottom of a standard letter-size page in portrait orientation or off the left edge in landscape orientation. This, of course, is somewhat limiting aesthetically.

Moreover, changing the paper size by means of software controls will not always override the sensors built into the paper tray. In such cases, you should *not* tape over the sensors to disable them. When the paper tray is reinserted into the printer, the sensors (and the tape that is covering them) may be located very close to the heating source that fuses the toner to the paper. Should the tape melt, it could damage not only the paper tray but the printer itself. A better way to override the tray sensors is simply to feed the paper manually.—Luisa Simone

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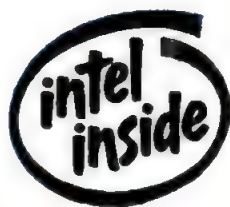
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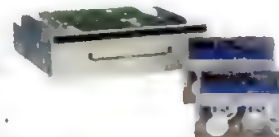
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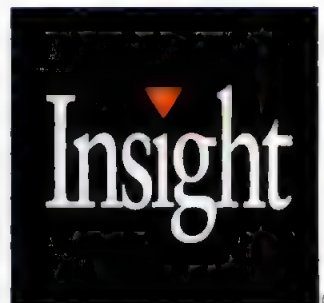
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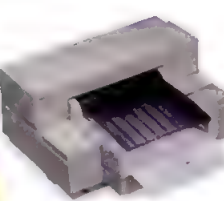
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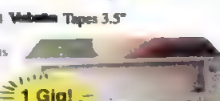
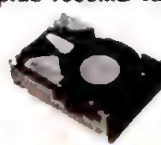
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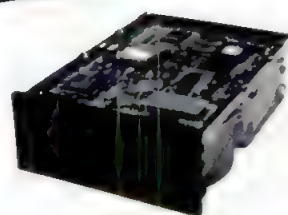
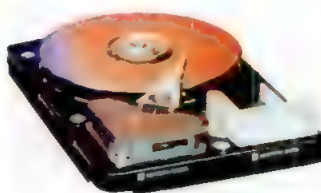
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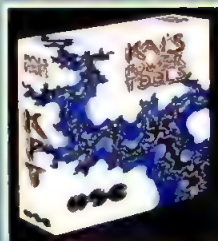
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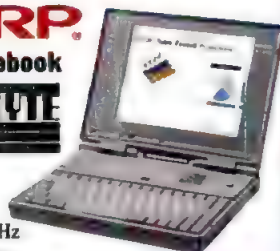
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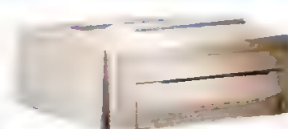
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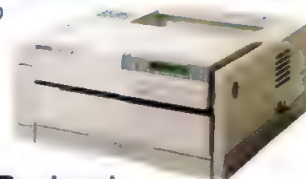
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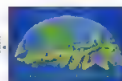
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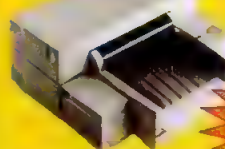
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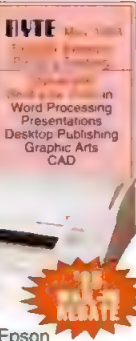
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ULTRA 3 Media	120
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PC-130E ArchNet	97
PC-800WS	115
PC-800FS	190

Product	Price
Etherlink II 8-Bit Coax	\$189
Etherlink II 8/16 Coax	157
Etherlink II 10BT	220
Etherlink II Coax	115
Etherlink II 10BT	199
Etherlink II MCA 10BT	238
Etherlink II Coax 10BT	228

Product	Price
ATI Graphics Ultra Pro EISA/2MB	\$389
ATI Graphics Ultra +2MB	235
Hercules HG210 Graphics w/1MB	222
Hercules D301 Dynamite Pro ISA	164
Hercules D302 Dynamite Pro ISA	226
BOCA Super VGA w/512K	69
BOCA Super Accelerator w/1MB	119
BOCA Voyager Local Bus	CALL
BOCA Vortex VRAM w/2MB 16-Bit	229
Orchid Fahrenheit 1280+	149

Product	Price
WYSE 30 Amber or Green	\$274
WYSE 55 Amber or Green	349
WYSE 60 Amber Green or White	374
WYSE 150 Amber Green or White	346
WYSE 160 Amber Green or White	401
WYSE 185 Amber Green or White	319
WYSE 325 Color	692
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December 7, 1993
Comtrade EISA Professional



January, April 1994
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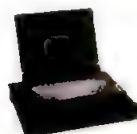
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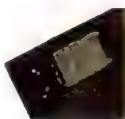
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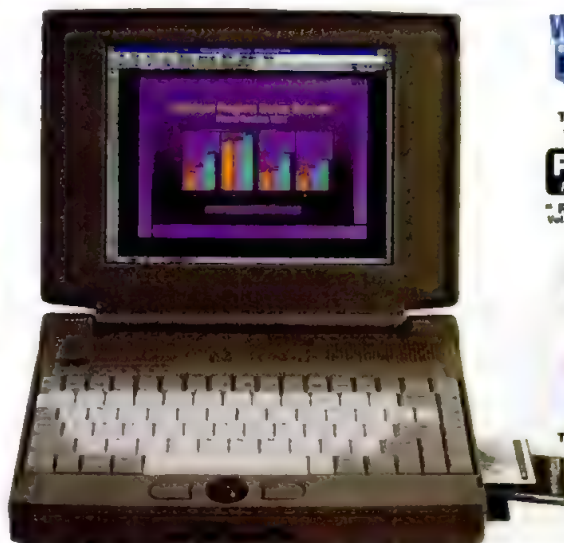
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TravelPro 5300
January 1994



"Recommended"
Vol. 9 No. 1 January 1994



TravelPro 5300
March 1994

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\$1985	DUAL
\$2895	ACTIVE
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MSB 7000	Compaq Contura	Dell Latitude	Samsung C400/450	DEC Ultrix	Toshiba 4700C	AMS TravelPro 5300
No	No	No	No	No	No	Yes
20MB	20MB	20MB	20MB	20MB	20MB	32MB
340MB	240MB	250MB	250MB	340MB	320MB	520MB
1024x768	800x600	800x600	800x600	1024x768	1024x768	1280x1024
486SL-33	486SL-25	486SL-33	486DX2-50	486DX2-50	486DX2-50	486DX4-100
1024x768	800x600	800x600	800x600	800x600	1024x768	1024x768
No	No	Yes	No	Yes	No	Yes
No	No	No	No	No	No	Yes
Stick	No	Yes	Yes	No	No	Yes

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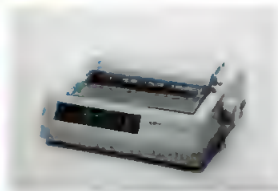
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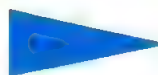
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OL810-\$899 OL830-\$1089 OL850-\$1189



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- 120 CPS L.Q.
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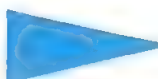
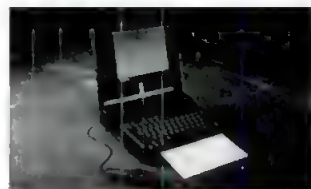


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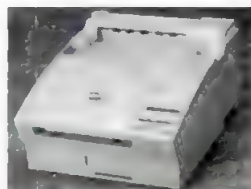
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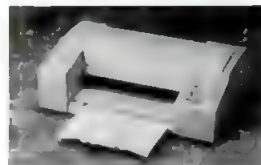
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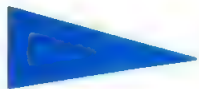
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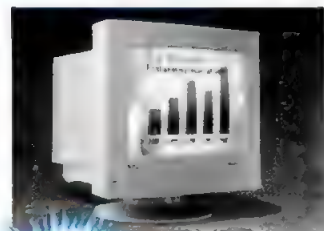


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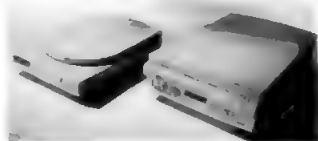


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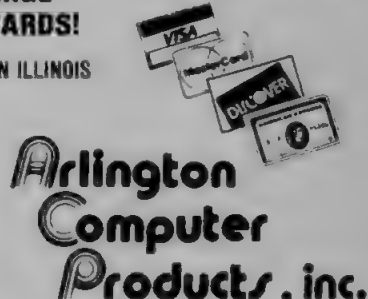
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486DX2/66 Multi-Media Hardware Feature Comparison

Feature	VTech	DELL	Gateway	Zeos
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Hard Drive	426MB	450MB	424MB	426MB
Floppy Drives	3.5"	3.5"	3.5"	3.5"
Video	1 MB VLB	1 MB VLB	1 MB VLB	1 MB VLB
3 Year warranty*	Yes	No	No	No
Double Speed CD-ROM	Yes	Yes	Yes	Yes
Sound Card & Speakers	Yes	Yes	Optional (\$132)	Optional (\$148)
Modem	Yes	Optional (\$79)	Optional (\$49)	Optional (\$49)
Remote Diagnostics Sftw.	Yes	No	No	No
Case	Full Size	Desktop	Baby AT	Desktop
External Cache	128K	128K	128K	No
Monitor	15"	15"	15"	Upgrade (\$95)
PC Computing Service Value Rating (Aug. 1993)	★★★★★	★★★★	★★★★	★★★★
Price*	\$2099	\$3074	\$2476	\$2762

The VTech Multi-Media systems are available with VTech's integrated local bus or with our new VESA local bus. All VTech desktop and tower systems come complete with VTech's 3 year warranty. *Contact your sales professional for details.

Multi-Media Systems You Can See and Hear

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- MS-DOS 6.2 & Windows 3.1
- Enhanced 101 - Keyboard & Mouse
- 3 Year Warranty*

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- 3.5" Diskette Drive
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- Dual Cooling Fans
- MS-DOS 6.2 & Windows 3.1
- Enhanced 101 - Keyboard & Mouse
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- 3.5" Diskette Drive
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- Dual Cooling Fans
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- VLB Graphics with 1MB
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- Dual Cooling Fans
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- Dual Cooling Fans
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- Enhanced 101 - Keyboard & Mouse
- 3 Year Warranty*

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- VLB Graphics with 1MB
- 3.5" Diskette Drive
- 15" VTech HiRez Monitor
- Dual Cooling Fans
- MS-DOS 6.2 & Windows 3.1
- Enhanced 101 - Keyboard & Mouse
- 3 Year Warranty*

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- 8MB RAM with 128KB Cache
- 424MB 13ms IDE Hard Drive
- VLB Graphics with 1MB
- 3.5" Diskette Drive
- 15" VTech HiRez Monitor
- Dual Cooling Fans
- MS-DOS 6.2 & Windows 3.1
- Enhanced 101 - Keyboard & Mouse
- 3 Year Warranty*

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- 527MB 12ms IDE Hard Drive
- VLB Graphics with 1MB
- 3.5" Diskette Drive
- 15" VTech HiRez Monitor
- Dual Cooling Fans
- MS-DOS 6.2 & Windows 3.1
- Enhanced 101 - Keyboard & Mouse
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- Enhanced 101 - Keyboard & Mouse
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- 8MB RAM
- 424MB 13ms IDE Hard Drive
- 256KB Copy Back Cache
- SCSI II w/ built-in BIOS support
- 16550 Serial Port Controllers
- Multiprocessor Upgrade Slot
- S3 VLB Accelerator with 1MB
- 3.5" Diskette Drive
- 15" VTech HiRez Monitor
- MS-DOS 6.2 & Windows 3.1
- Enhanced 101 - Keyboard & Mouse
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- 527MB 12ms IDE Hard Drive
- Double Speed CD-ROM
- 256KB Copy Back Cache
- SCSI II w/ built-in BIOS support
- 16550 Serial Port Controllers
- S3 VLB Accelerator with 1MB
- 3.5" Diskette Drive
- 15" VTech HiRez Monitor
- Windows NT
- MS-DOS 6.2 & Windows 3.1
- Enhanced 101 - Keyboard & Mouse
- 3 Year Warranty*

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Platinum P5-60

- Intel 60MHz Pentium™ CPU
- 8MB RAM with 256k Cache
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- MS-DOS 6.2 & Windows 3.1
- Quality Keyboard, Mouse
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- 3.5" Diskette Drive
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- Enhanced 101 -Keyboard & Mouse
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- 14" VTech HiRez Monitor
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- MS-DOS 6.2 & Windows 3.1
- Enhanced 101 -Keyboard & Mouse
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Expo 486DX2/50

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- 4MB RAM with 128KB Cache
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- Full Size Metal Desktop Case
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- Enhanced 101 -Keyboard & Mouse
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- Full Size Metal Desktop Case
- MS-DOS 6.2 & Windows 3.1
- Enhanced 101 -Keyboard & Mouse
- 3 Year Warranty*

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ExpoNote 486SLC/33

The ExpoTech Notebooks offer a great combination of features and price. The removable hard drive provides versatility usually found only on systems costing hundreds more.

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- 9600/2400 Data/Fax modem
- 1 Year Warranty on Notebooks

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- 120MB Hard Drive
- Removable Hard Drive
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- Full Size Mouse

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Modem not included in 386SX/33



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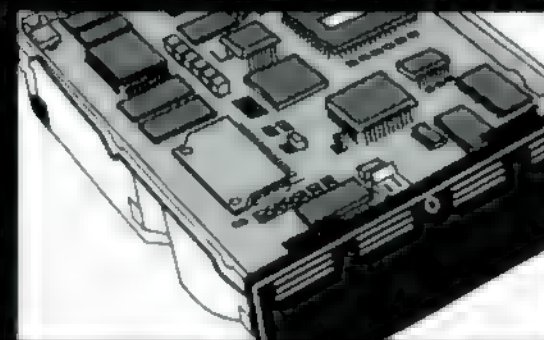
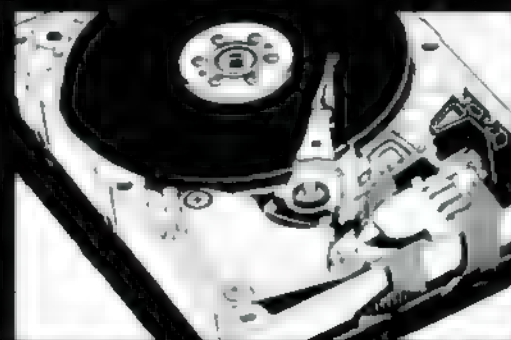
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540MB Drive, GSI-21, 250MB Tape, 2 tapes	\$609
540MB Drive, Local Bus Cache card	\$529
1Gig Drive, GSI-21 accelerator card	\$799
1Gig Drive, GSI-21, 250MB Tape, 4 tapes	\$939

SCSI DRIVE BUNDLES

1Gig Drive, 16Bit ISA	\$869
1Gig Drive, Local Bus Cache Card	\$1079
1Gig Drive, 2Gig DAT, 1 tape	\$1599
1Gig Drive, 32Bit Local Bus	\$929
1.7Gig Drive, 16Bit ISA	\$1099
1.7Gig Drive, Local Bus Cache Card	\$1309
1.7Gig Drive, 2Gig DAT, 1 tape	\$1839
1.7Gig Drive, 32Bit Local Bus	\$1169

WIDE SCSI BUNDLES

1Gig Drive, 32Bit EISA or VLB card	\$1399	2Gig Drive, 32Bit EISA or VLB card	\$2099
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SyQuest

IDE Drive Bare 105 / 270 \$239 / \$409
with GSI-18 & 1 disk \$329 / \$519
Portable external, attaches to printer port with 1 cartridge \$399 / \$619

3 1/2" Removable Media Drives. The #1 storage solution of the 1990's. Hard drive speed, low cost per MB. Mounts in 3 1/2" or 5 1/4" bay. Great for unlimited upgradability, data archival, etc. 105MB 14.5ms, 64K buffer. 270MB 13.5ms, 128K buffer.

SCSI Drive Bare 105 / 270	\$279 / \$429
with Adaptec 1522 & 1 disk	\$399 / \$629
with Adaptec 1542 & 1 disk	\$529 / \$759
External for Macintosh & 1 Disk	\$399 / \$629



GSI drive accelerators increase the data transfer rate of your IDE drive 30 to 80%. Works by enabling the drives Read Multiple & Write Multiple commands to greatly increase performance. We highly recommend these products for WD, Conner, Quantum, Seagate, Micropolis, Maxtor, & Fujitsu. Alone w/Drive GSI-21 Board supports 2 IDE, 4 floppy drives. Doubles QIC-80 tape drive speed \$65 \$55
GSI-18 Board supports 2 IDE drives. Works in conjunction with MFM, RLL, etc. \$55 \$45
GSI-32 Board same as -21 adds 2 16550 serial ports & 1 bi-directional parallel port \$139 \$119
GSI MaxIDEA Software solution works on existing IDE configuration (requires less than 1K of memory). Includes performance benchmark test. \$34 \$25

HARD DRIVES

CONNER

IDE			
210MB	14ms	CFS210A	\$202
340MB	13ms	CFA340A	\$272
420MB	14ms	CFS420A	\$290
541MB	12ms	CFA540A	\$399
1060MB	9ms	CFP1060A	Call
SCSI			
1060MB	9ms	CFP1060S	\$789

Maxtor

IDE			
245MB	15ms	7245A	\$249
345MB	14ms	7345A	\$278
540MB	12ms	7546A	\$392

MICROPOLIS

IDE			
1050MB	10ms	MC4110A	\$749
1740MB	10ms	MC2217A	\$969
SCSI			
1052MB	8.5ms	MC4110	\$749
1740MB	10ms	MC2217	\$969
3020MB	11ms	MC1936	\$1999
SCSI-AV Audio / Visual tuned drives			
1000MB	10ms	MC2210AV	\$829
1700MB	10ms	MC2217AV	\$1039
3000MB	11ms	MC1936AV	Call

Seagate

IDE			
213MB	16ms	ST3243A	\$204
260MB	16ms	ST3290A	\$222
341MB	13ms	ST3391A	\$280
452MB	12ms	ST3550A	\$323
SCSI (WIDE SCSI also available)			
1690MB	8ms	ST11950N	\$1469
2145MB	8ms	ST12550N	\$1639
2148MB	9ms	ST12400N	\$1399

WESTERN DIGITAL

IDE			
256MB	12ms	AC2250	\$228
341MB	12ms	AC2340	\$265
425MB	12ms	AC2420	\$279
540MB	11ms	AC2540	\$395
730MB	10ms	AC2700	\$565
1083MB	10ms	AC31000	\$739

HARD DRIVES

Quantum

IDE			
170MB	14ms	LPS170A	\$199
270MB	12ms	LPS270A	\$229
342MB	12ms	LPS340A	\$269
541MB	12ms	LPS540A	\$425
SCSI			
170MB	14ms	LPS170S	\$199
270MB	12ms	LPS270S	\$229
342MB	12ms	LPS340S	\$289
541MB	12ms	LPS540S	\$449
1080MB	10ms	IMP1080	\$769
1800MB	10ms	PD1800S	\$969
2160MB	9.5ms	IMP2160S	Call

digital

2103MB	9ms	DSP3210	\$1559
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35 & 40	\$229	\$289	\$339
50 thru 95 SCSI	\$429	\$469	\$549
PS/2	210MB	420MB	540MB
50 thru 95 IDE	\$429	\$599	\$729

CONTROLLER CARDS

ADAPTEC	Alone	w/Drive
A1522BASIC 16Bit SCSI	\$129	\$109
A1542CBASIC 16Bit SCSI	\$225	\$215
A2742 EISA SCSI	\$389	\$369
A2842 VESA SCSI	\$319	\$299
FUTURE DOMAIN		
1680SVP 16Bit SCSI	\$155	\$139
NexStor PCI SCSI	\$169	\$149
ALPHA RESEARCH CACHING CARDS		
S4251 16Bit IDE	\$99	\$89
S4751 32Bit Local Bus IDE	\$139	\$129
S4851 32Bit PCI IDE	\$229	\$219
S425S 16Bit SCSI	\$229	\$219
S475S 32Bit Local Bus SCSI	\$369	\$359
Many other types of controllers in stock.		

CD ROM DRIVES

NEC	CDR900	4X	180ms	\$979
NEC	CDR510	3X	195ms	\$389
Toshiba	XM3401	2X	200ms	\$319
Toshiba	XM4101	2X	320ms	\$219
Sony	CDU561	2X	295ms	\$289
Tec	CD50	2X	265ms	\$259
Pioneer External CD Changers (300ms)				
DRM602X	6 disc	307KB/sec		\$869
DRM604X	6 disc	612KB/sec		\$1149
DRM1804X	18 disc	612KB/sec		\$2059

MULTIMEDIA KITS

SCSI Drive, sound card (in retail pkg)
MV=Media Vision Pro Audio 16. MS=Media Vision Pro Studio 16
SB=Sound Blaster 16 SCSI SA=Sound Blaster SCSI ASP

	MV	MS	SB	SA
XM4101	\$359	\$389	\$419	\$459
CD50	\$399	\$429	\$449	\$489
CDU561	\$429	\$459	\$469	\$519
XM3401	\$459	\$489	\$519	\$559
CDR510	\$509	\$539	\$579	\$609
CDR900	\$1119	\$1149	\$1159	\$1199

CD ROM TOWERS

CD ROM Drive Towers - Multiple CD ROM drives in a single external enclosure. Great for networks, BBS, or business.

	2 Drive	4 Drive	7 Drive
XM4101	\$579	\$1259	\$2249
CD50	\$649	\$1389	\$2479
CDU561	\$699	\$1479	\$2639
XM3401	\$789	\$1659	\$2999
CDR510	\$939	\$1999	\$3499
CDR900	\$2119	\$4339	\$7489

BUNDLE SPECIALS WITH ANY CD DRIVE PURCHASE!

Free \$25 ADI Photo CD processing coupon with each CD ROM Drive!
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Drive & controller on card. Saves drive bay. Compatible with XT, AT, Tandy, PS/2 and others. Super easy installation! IDE / SCSI
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340MB \$379 / \$409 540MB \$619 / \$649

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IOMEGA 250MB QIC-80 tape drives include 3yr warranty, software, 1 tape. Alone w/drive
Internal fits 3.5 or 5.25 bay \$159 \$149
External for printer port \$319 \$309

3 Pack of IOMEGA formatted DC2120 tapes \$40 with any purchase!

SCSI Tape Drives

Kit is 16Bit card & 1 tape	Bare	Kit
750-15Gig Exabyte 2501	\$549	\$739
2Gig Conner 4320	\$799	\$969
2Gig HP 35470	\$929	\$1049
4-8Gig Conner 4324	\$1119	\$1329
4-8Gig HP 35480	\$1059	\$1279
4-16Gig Sony SDT5000	\$1099	\$1299
4-16Gig HP C1533A	\$1499	\$1699

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High quality, High Performance optical drive solutions include controller, COREL SCSI and 1 disk.

128MB \$769 230MB \$999 1300MB \$2499
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MISCELLANEOUS

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Floppy Combo 1.2 & 1.4	\$115 \$105
Maxtor 105MB PCMCIA drive	\$429
PCMCIA to SCSI adapter	\$319
Desktop Docking Module! Mounts in 5 1/4" drive bay. Allows you to use any PCMCIA in your desktop	\$159

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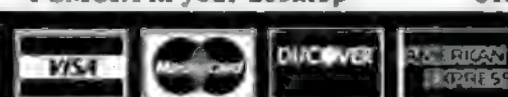
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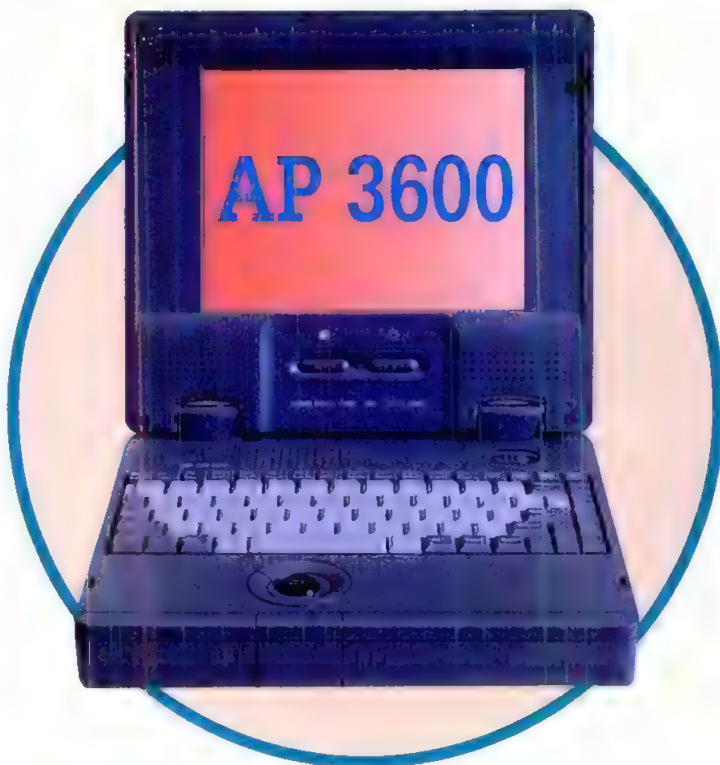
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Introducing FOSA's Pentium & 486DX-4 Notebook

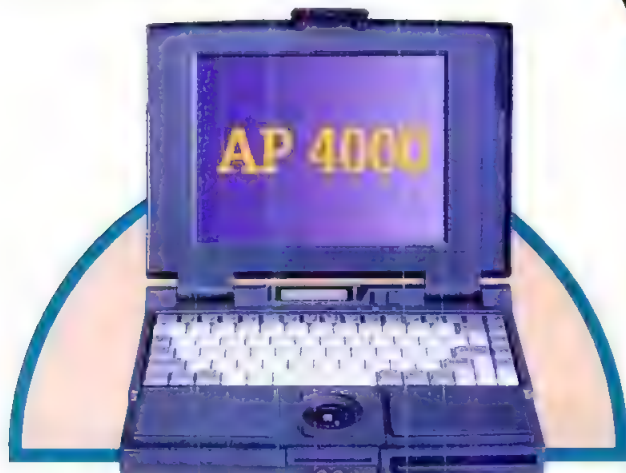


- Intel 486SL enhanced upgradeable CPU (486SX>DX>DX2>DX4)
- 1 MB video RAM
- Super fast 32-bit VESA Local Bus video with Windows Accelerator
- Built-in Audio Chip, Microphone & Speaker (Now you can record, compress, store and playback voice, sound, and music to disk)
- Extra large Capacity NiMH Battery
- Extra Large Built-in 25mm Trackball
- 2 PCMCIA type I & II or 1 type III slots
- 4 MB RAM expandable to 32 MB
- Detachable 250 MB Hard Drive
- Removable 3.5" 1.44 MB Floppy Drive exchangeable to second Battery
- 9.5" detachable LCD pane 640 x 480 VGA Display 256 colors or 64 Gray shades CRT: 1024 x 768 256 colors
- Simultaneous LCD & CRT operation
- 180° LCD Display Angle Rotation
- Built-in system Management Mode (SMM)
- Ports for IS, 1P, Ext. Keyboard, Ext. VGA monitor, & 160 pin connector for Docking Station
- 85/86-Key Keyboard
- Microsoft DOS 6.21
- Carrying Bag & AC/Adapter
- Weight 5.9lbs. (with Battery)
- 11.4" W x 8.7" D x 1.77" H.
- Optional Docking Station & PCMCIA interface cards

- Intel Pentium™ 60/66 MHz CPU
- 1 MB video RAM
- 32-bit VESA Local Bus Video with Windows Accelerator
- Super fast 32-bit Local Bus IDE
- Built-in Audio Chip, Microphone & 2 Speakers (Now you can record, compress, store and playback voice, sound, and music to disk)
- Extra large Capacity NiMH Battery (46 watts)
- Extra Large Built-in 25mm Trackball
- 1 PCMCIA type III & 1 PCMCIA type II slots
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- Removable 250 MB Hard Drive (340,520MB Optional)
- 3.5" 1.44 MB Floppy Drive
- 9.5" 640 x 480 VGA Display 256 colors or 64 Gray shades CRT: 1024 x 768 256 colors
- Simultaneous LCD & CRT operation
- 1 16C550 compatible serial port
- 1 parallel port with ECP/EPP support
- Built-in system Management Mode (SMM)
- Ports for Ext. Keyboard, Ext. VGA monitor, & 200 pin connector for Docking Station
- 86-Key Keyboard
- Microsoft DOS 6.21
- Carrying Bag & AC/Adapter
- Weight 8.15lbs (with Battery)
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- 2-Hours Quick Charge
- Optional Docking Station & PCMCIA interface cards



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AP 3600/Pentium-50		\$3595	\$4595
AP 4000/486SX-33	\$1645	\$2145	\$3145
AP 4000/486DX-33	\$1795	\$2295	\$3295
AP 4000/486DX2-44	\$1965	\$2465	\$3465
AP 4000/486DX4-100	\$2215	\$2715	\$3715



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For outstanding achievement in customer satisfaction...the prize goes to MidWest Micro. After more than a decade in the business, MidWest Micro is still making headlines across America with top-of-the line products, great value and friendly service. You know you can count on us for the latest technology at the best possible prices.

HOT OFF THE PRESS

At MidWest Micro, we always go out of our way for you. We even give you the option of custom configuring a desktop system in one of five sleek case designs (slimline, desktop, mini-tower, middle-tower and full-tower). We'll install fax modems, more RAM, a larger hard drive and more.



The Real 3 Year Warranty

You heard it here first - when you order an Elite Desktop System from Midwest Micro, it comes with a Full Three Year Warranty. Unlike other companies' warranties, the Real Warranty is under and unedited. Everything is included - the hard drive, monitor and all internal components. That's right, your entire desktop system is under warranty for three full years - yes, even the hard drive. Other companies charge hundreds of dollars for this kind of coverage. Midwest Micro gives it to you for free. Why? Because we're confident enough to offer such a great warranty at no extra cost - and that's a straight fact!



FRONT PAGE NEWS

MidWest Micro tops the news with the Real Three Year Warranty that covers the monitor, hard drive and all internal components - but we don't want to offset all the other services our customers enjoy, like a **30-Day Money Back Guarantee, Immediate Parts Replacement Policy, Lifetime Toll-Free Technical Support and an On-Line Bulletin Board Service.** No matter how the other companies word it, they just don't deliver service and support like this.

Great products, a well-informed sales team and unbeatable prices - it's no wonder MidWest Micro has earned 14 Computer Shopper Best Buy Awards (chosen by Shopper readers) and PC Computing's Five-Star Rating for outstanding service and support. (Check out the article in *The Midwest Times*!) MidWest Micro has been on a winning streak since 1989, and we don't plan on slowing down anytime soon. We're not the only ones winning, though. With affordable technology and friendly service, when you buy from MidWest Micro, you win, too.



MidWest Micro

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*News Never
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Another highlight of PCI Technology is great video performance. It gives you up to 16.7 million colors (that won't wash out after you shampoo) and 1280 x 1024 resolution. And with refresh rates up to 90 Hz, screens redraw faster than you can say split ends!

What Else Is New?

What's new? Elite's new line of Pentium Systems travel at an amazing 90 MHz processing speed, one of the fastest speeds available. Known as P5-90s, these Elites also run cooler and draw significantly less power. If you want to make some permanent waves, order an Elite P5-90 Pentium System from MidWest Micro.

Wait, There's More...

The curling iron isn't all that's hot — so are Elite DX4 VESA Systems! We're talking processing speeds up to 75 and 100 MHz! News hasn't traveled this fast since the grapevine was invented! Plus, with a powerful VESA Local Bus, you get increased throughput and high-speed video.

MidWest Micro's Intel-based Systems give you more than high speed and excellent performance. They also come with large hard drives and MS-DOS 6.2® and WFW™ 3.11 installed. Some configurations even include a double speed multimedia CD-ROM drive and an internal send and receive fax modem! Call the company that everybody's talking about — call MidWest Micro today.



Pentium technology is a lot more than just small talk. It can execute two instructions at once, produce processing speeds up to 90 MHz, and make everyday applications run even better. Pentium processors also provide the power needed for new multimedia applications and desktop video conferencing.

And if clock-tripling VESA performance dominates your conversations, you need an Elite DX4 VESA System. With a powerful VESA Local Bus, fast processing speed and double-speed CD-ROM drive, this System never makes you wait! If you'd like to talk more about Elite DX4 and Pentium Systems, call one of the friendly sales representatives at MidWest Micro — they love to talk, too!

MidWest Micro

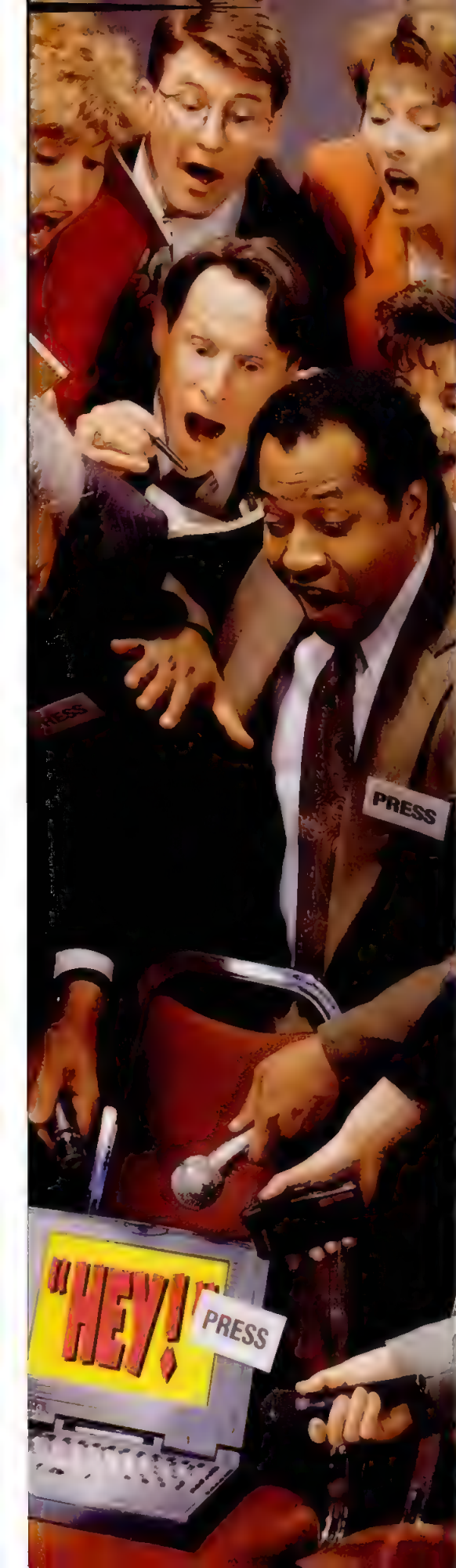
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AD#G601



"At the top of the heap is the Midwest Model Elite...which certainly lives up to its name. Its high double-scan input, as well as intelligent design and quality assembly. When you add to that its impressive battery life and full-line support, at a very reasonable price, the Elite is the class of this field."

Computer Shopper, May 1994



THE ELITE SOUNDBOOK STEALS THE SPOTLIGHT

This Notebook's Got Something To Say

There's simply no better way to get the word out than with the Elite SoundBook from MidWest Micro. Featuring built-in audio capabilities and the processor, hard drive and screen of choice, the Elite SoundBook is always attracting attention (even when it's not supposed to)!

It Can't Keep Quiet!

It's hard for the SoundBook to keep quiet since it comes with a built-in microphone and speaker, external jacks and bundled audio software. The software lets you easily record, compress, store and playback voices, sounds or music. Plus, the Elite features a PCMCIA Type III slot so you can add modems, flash memory, network adapters, and more.

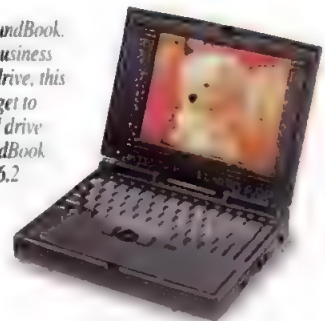
Attracting Attention From Every Angle

The SoundBook also attracts attention with its visual performance. Available in monochrome, dual-scan color and active-matrix color, these screens make presentations look great.

A Keynote Speaker

Even when it's part of the audience, the Elite SoundBook steals the spotlight. Business presentations have never looked or sounded so good! And it comes in a variety of configurations, so you can pick the one that best suits your needs. You can even select a processor with a clock-tripling 100 MHz processing speed! With its long battery life, up to 520 Mb hard drive and local bus video with 1 Mb video DRAM, this lightweight notebook really makes a statement. Invite the Elite SoundBook to your next press conference. It won't just be the topic of discussion—it'll be the main speaker!

The media can't stay away from the Elite SoundBook. With 4 Mb of RAM (expandable to 20 Mb), business audio features and a user replaceable hard drive, this notebook is hot news! And the fact that you get to choose your own processor, screen and hard drive has really got reporters interested. The SoundBook even comes with Lotus Organizer, MS-DOS 6.2 and WFW 3.11 installed. Whether you'd like the color (6.7 lbs.) or monochrome (6.2 lbs.) version, the Elite SoundBook steals the show.



News On a Lighter Note

Ready for more good news? The Elite 486SX-33 SubNote weighs only 3.9 lbs. and comes with a dual-scan color or monochrome screen. With its high-speed RAM and fast processor, this SubNote really beats the press! If you like the lighter side of the news, you're going to love the Elite 486SX-33 SubNote.

MidWest Micro

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PENTIUM PCI SYSTEMS

P5-60 \$2299

- #007830
- Intel® 60 MHz Pentium™ Processor
- 8 Mb RAM, 256 Kb Cache
- 340 Mb IDE Hard Drive
- PCI Fast IDE Interface
- PCI Local Bus Graphics
- 3.5" Disk Drive
- 15" SVGA .28 N/I Multi-Scan Color Monitor with Hitachi CRT
- 8-Bay Middle-Tower Case
- 4 ISA, 2 PCI & 1 PCI/ISA Slots
- 101-Key Enhanced Keyboard
- High-Resolution Mouse
- MS-DOS™ 6.2 and WFW™ 3.11

P5-66 \$2699

- #007831
- Intel 66 MHz Pentium Processor
- 8 Mb RAM, 256 Kb Cache
- 528 Mb IDE Hard Drive
- PCI Fast IDE Interface
- PCI Local Bus Graphics with 2 Mb
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- High-Resolution Mouse
- MS-DOS 6.2 and WFW 3.11

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- Pro Audio 16 Sound Card
- Digital Quality, Compact Speakers
- Internal 14.4 S/R Fax Modem
- 3.5" Disk Drive
- 15" SVGA .28 N/I Multi-Scan Color Monitor with Hitachi CRT
- 8-Bay Middle-Tower Case
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- 101-Key Enhanced Keyboard
- High-Resolution Mouse
- MS-DOS 6.2 and WFW 3.11

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- Intel 90 MHz Pentium Processor
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- 528 Mb IDE Hard Drive
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- Intel PCI Local Bus Graphics with 2 Mb
- Double Speed CD-ROM Drive
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486DX-33 \$1379

#006675

486DX2-50 \$1399

#006676

486DX2-66 \$1799

- #006677
- Intel 486DX2-66 Processor
- 8 Mb RAM, 128 Kb Cache
- 340 Mb IDE Hard Drive
- 32-Bit VESA Local Bus Graphics with 1 Mb
- 32-Bit VESA Local Bus IDE
- Double Speed CD-ROM Drive
- 3.5" Disk Drive
- 15" SVGA .28 N/I Multi-Scan Color Monitor with Hitachi CRT
- 8-Bay Mini-Tower Case
- 5 ISA & 3 VESA/ISA Slots
- 101-Key Enhanced Keyboard
- High-Resolution Mouse
- MS-DOS 6.2 and WFW 3.11

486DX-33 \$1679

#007808

486DX2-50 \$1699

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DX4-75 \$2399

- #007826
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- 32-Bit VESA Local Bus IDE
- Double Speed CD-ROM Drive
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- 8-Bay Mini-Tower Case
- 5 ISA & 3 VESA/ISA Slots
- 101-Key Enhanced Keyboard
- High-Resolution Mouse
- MS-DOS 6.2 and WFW 3.11

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DX4-100 PCI \$2999

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- Double Speed CD-ROM Drive
- Microsoft 3 Disk CD-ROM Software Library – Encarta™, Works™ & Money™
- Pro Audio 16 Sound Card
- Digital Quality, Compact Speakers
- 9624 Internal S/R Fax Modem

- 3.5" Disk Drive
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- Slimline Case
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- High-Resolution Mouse
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#007328 **\$1999**

486DX-33 with 260 Mb HDD
#007329 **\$2199**

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#007330 **\$2299**

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#007331 **\$2499**

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#007332 **\$2799**

DX4-100 with 520 Mb HDD & 8 Mb of RAM
#007333 **\$2999**

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486DX-33 with 260 Mb HDD
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DX2-50 with 340 Mb HDD
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- Turbo Bus Accelerated Video
- 3.5" External Disk Drive
- User Replaceable Hard Drive
- One Type II PCMCIA Slot
- Built-in Trackball

- NiMH Battery & AC Adapter
- Advanced Power Management with SMM
- One Parallel & One Serial Port
- External VGA & Keyboard Port
- MS-DOS 6.2
- Weight: 3.9 lbs.
- Carrying Case

Monochrome SubNote

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Dual Scan Color SubNote

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486SX-33 with 340 Mb HDD & WFW 3.11
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Z-NOTE

Processor	Screen	Hard Drive	Price
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486SL/33	Active	200MB	\$4199

Lease for \$96/mo.



Z-STAR



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Processor	Hard drive	Price
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486SX/25	170MB	\$919
486SX/33	170MB	\$1009
486DX/33	260MB	\$1249
486DX/33MT	260MB	\$1309
486DX2/66	345MB	\$1629
486DX2/66MT	345MB	\$1839

*VGA color monitors begin at \$209.99

\$779*



RAM
8MB
16MB

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Video	Price
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20M-Wm	\$2479

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\$2149*



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- ▲ 486SX/25 processor
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Screen	Model	Hard Drive	Price
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Mono	173W	170MB	\$1539
Dual scan	123W	120MB	\$2279
Dual scan	173W	170MB	\$2399
Active matrix	173W	170MB	\$2899

Lease for \$60/mo.



Bravo NB



Bravo LC

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- ▲ 120/170/210MB hard drive

Model	Hard Drive	Price*
4/25s Model 123W	120MB	\$999
4/33 Model 123W	120MB	\$1229
4/33 Model 173W	170MB	\$1359
4/33 Model 213W	210MB	\$1539
4/66d Model 213W	210MB	\$1979

*Monitors sold separately
Lease for \$50/mo.



Bravo LC

PowerExec

Model	Screen	Price
4/25SL Model 203/W	Mono	\$1979
4/25SL Model 203/W	Active color	\$3699
4/33SL Model 203/W	Monochrome	\$2259
4/33SL Model 203/W	Active color	\$3899
4/33SL Model 343/W	Active Matrix	\$4299

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Bravo MT

Model	Hard Drive	Price*
4/33 Model 3	Optional	\$1239
4/33 Model 173W	170MB	\$1519
4/33 Model 343W	340MB	\$1979
4/66d Model 3	Optional	\$1659
4/66d Model 173W	170MB	\$1929
4/66d Model 343W	340MB	\$2399

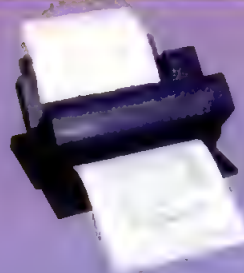
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- ▲ Low cost optional color kit

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DeskWriter 310 \$299.99

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- ▲ Sharp, 600 dpi "laser-like" print quality
- ▲ Resolution Enhancement Technology for smooth, crisp text and graphics
- ▲ 3-Year warranty

DeskJet 520 \$299.99

DeskWriter 520 \$299.99

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- ▲ Color 600 dpi "laser-like" print quality
- ▲ Resolution Enhancement Technology for smooth, crisp text and graphics
- ▲ 3-Year warranty

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- ▲ Ballpoint mouse with Quickport
- ▲ Enhanced power management

Model	Processor	Screen	Hard Drive	Price
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T1910	486SX/33	Dual scan color	120MB	\$2099
T1910	486SX/33	Dual scan color	200MB	\$2329
T1950	486DX2/40	Monochrome	200MB	\$2099
T1950	486DX2/40	Dual scan color	200MB	\$2719
T1950	486DX2/40	Active color	200MB	\$3029
T1950	486DX2/40	Active color	320MB	\$3399

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T4700/T4800

- ▲ 8MB RAM, expandable to 24MB
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Model	Processor	Screen	Hard Drive	Price
T4700	486DX2/50	Dual scan color	200MB	\$3999
T4700	486DX2/50	Dual scan color	320MB	\$4329
T4700	486DX2/50	Active color	200MB	\$4599
T4700	486DX2/50	Active color	320MB	\$4949
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T4800



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BJC600, 360dpi, Energy Star	\$589 99

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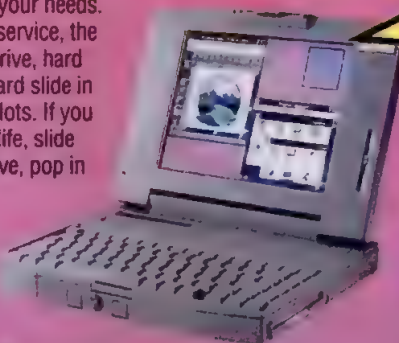
Processor	Screen	Hard drive	Price
DX2/40	Active color	120MB	\$3819
DX2/40	Active color	250MB	\$4229
DX2/50	Monochrome	209MB	\$3259*
DX2/50	Active color	209MB	\$4499
DX2/50	Active color	340MB	\$4919
DX4/75	Active color	340MB	\$5229

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The Versa E notebook series is upgradable to grow with your needs. For ease of upgrade and service, the UltraLite Versa's floppy drive, hard disk drive and memory card slide in and out of their storage slots. If you require extended battery life, slide out the Versa's floppy drive, pop in a second battery, and double your time on the road.

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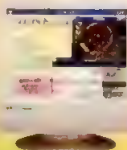
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- ▲ Graphics accelerator
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- ▲ MS DOS, Windows 3.1, NEC mouse

Processor	Hard drive	Price
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486DX2/50	210MB	\$1399
486DX2/66	210MB	\$1749

NEC SVGA monitor \$319.99
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- ▲ Local bus graphics
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- ▲ MS DOS 6.0, Windows 3.1

Processor	RAM	Hard Drive
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486SX/33	4MB	240MB
486DX/33	4MB	240MB
486DX2/66	4MB	340MB



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- ▲ MS DOS 6.0, Windows 3.1, trackball
- ▲ 3-year warranty

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- ▲ 9.5" mono display
- ▲ 2 TYPE II or 1 Type III PCMCIA slots
- ▲ Untethered intelligent pen
- ▲ Integrated, detachable keyboard
- ▲ MS DOS 6.0, Windows 3.1, InkWare NoteTaker, PenPower for Excel

COMPAQ Contura Aero

- ▲ 486SX/25 or 486SX/33 processor
- ▲ Type II PCMCIA slot
- ▲ Integrated trackball
- ▲ Weighs only 3.5 lbs.(mono), 4.31 lbs.
- ▲ MS-DOS, Windows 3.1

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- ▲ 3.5" floppy drive
- ▲ Local bus graphics
- ▲ 5 expansion slots, 5 drive bays
- ▲ COMPAQ mouse
- ▲ MS DOS 6.0, Windows 3.1, TabWorks

Processor	RAM	Hard Drive
486SX/33	4MB	340MB
486DX2/50	4MB	340MB
486DX2/66	8MB	525MB

ProLinea Net1

- ▲ 486SX/25 or 486SX/33 processor
- ▲ 4MB RAM expandable to 20MB
- ▲ 3.5" floppy drive
- ▲ 100MB or 200MB hard drive
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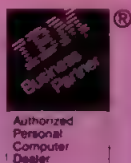
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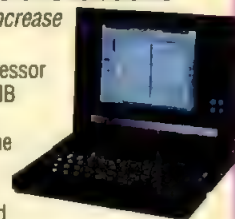
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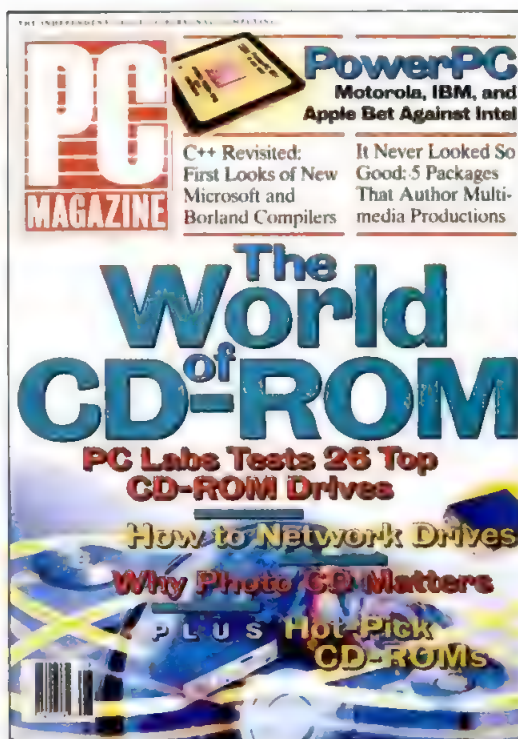
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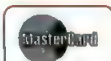
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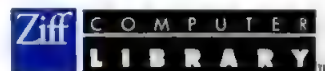
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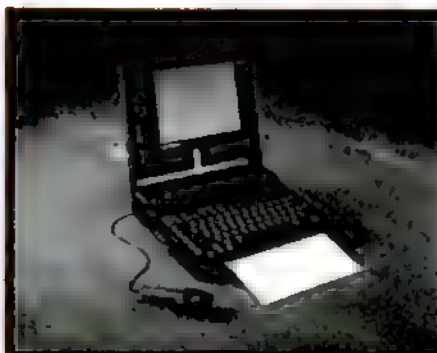
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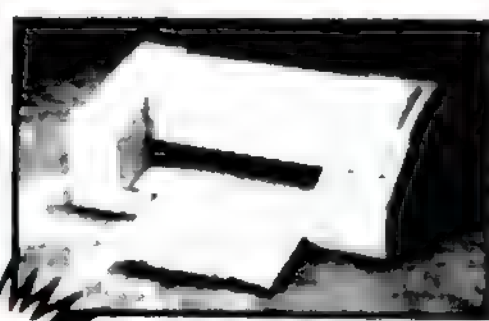
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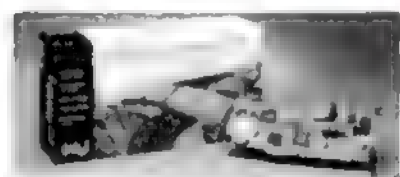
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Teac Dual Floppy Drives	109

Tape Drives

CONNOR - 250	149
COLORADO MEMORY SYSTEMS	
DJ10 120 Meg Int Jumbo	119
DJ20 120 Meg Int Jumbo	155
Trakker 120	215
Trakker 250	309
2120 Formatted Tape	19
MICRO SOLUTIONS	
80/250 Backpack	339
CD-2x	389
Back Pack 200 MG Drive	429

CD Rom

NEC	
3Xe/3Xi	489/ 415
3XP/4X Pro	419/849
TECEL	
3028-INT-DS	289
5028-EXT-DS	329
CHINON	
535 INT	305
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1 mg/4 mg Simms	49/159
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Cyrix DRX2-2040	249
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INTEL	
387 SX or DX	85
Overdrive SX20/25	279/279
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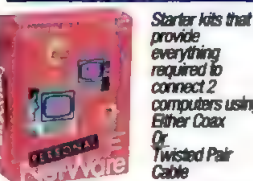
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NodeRunner S Coax or 10BaseT 15/10 99.9/79.9
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- \$1269 486 33SX 250MB SVGA**

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- SMC Elite 3608 8 Port 369
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\$1985 486DX 66MHz LOCAL BUS

- 8MB RAM
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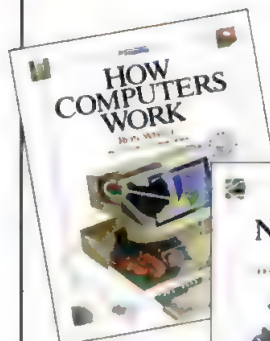
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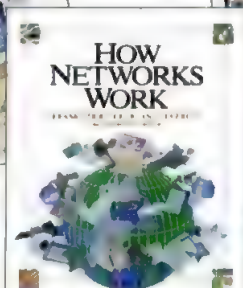
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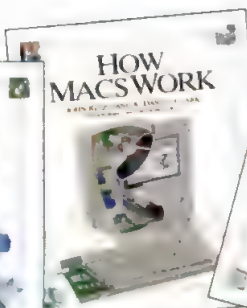
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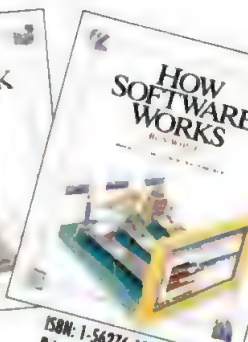
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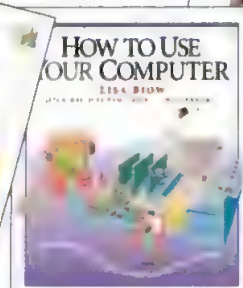
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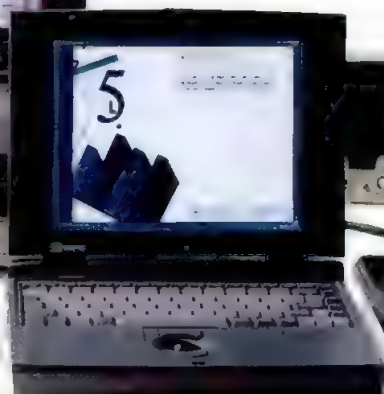
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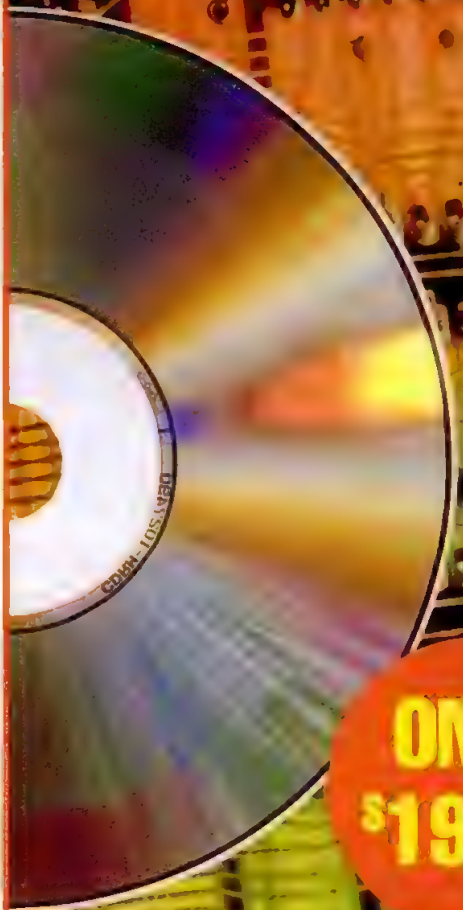


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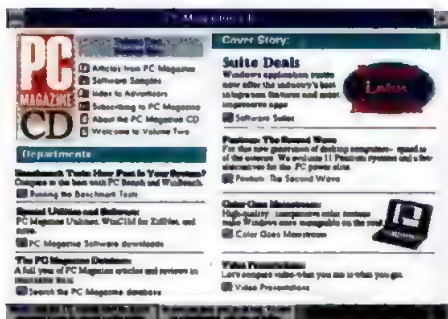
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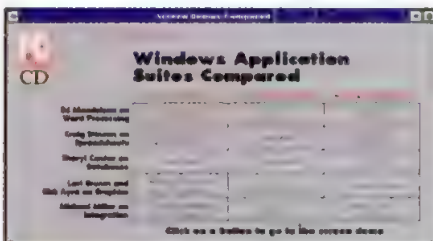
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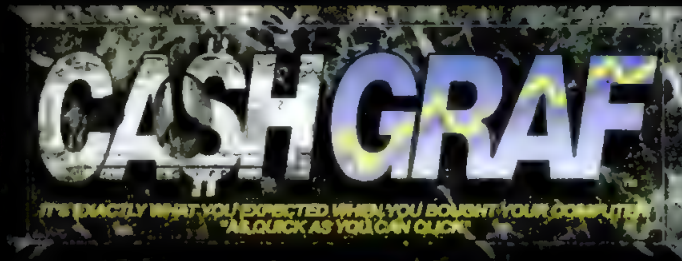
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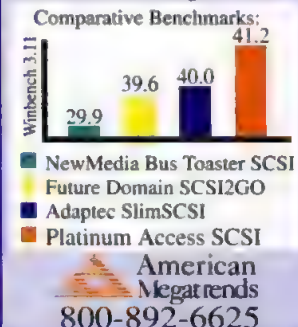
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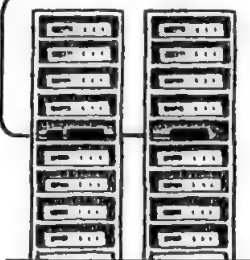
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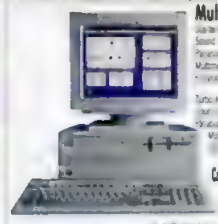
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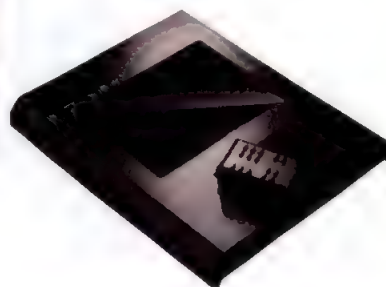
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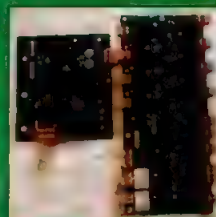
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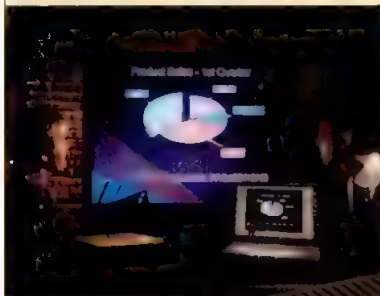


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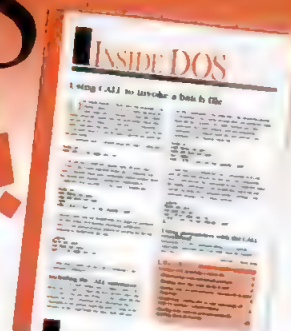
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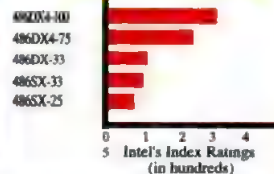
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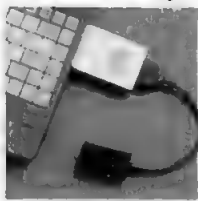


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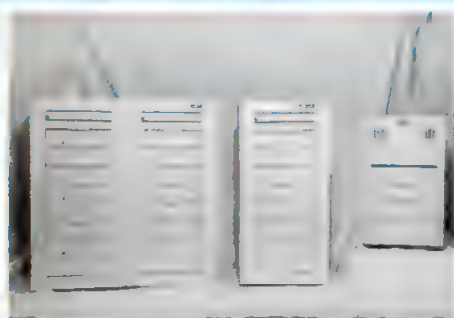


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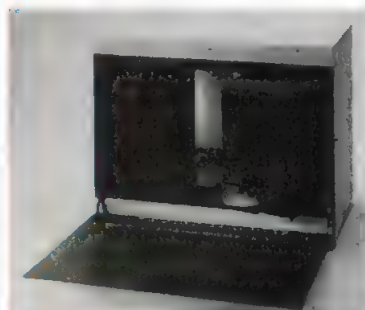
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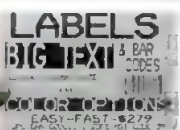
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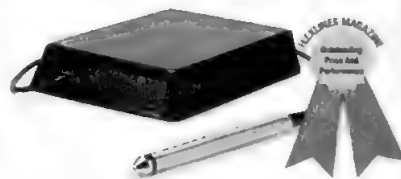
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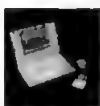
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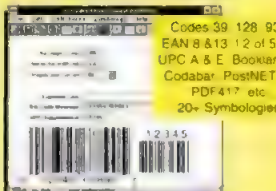
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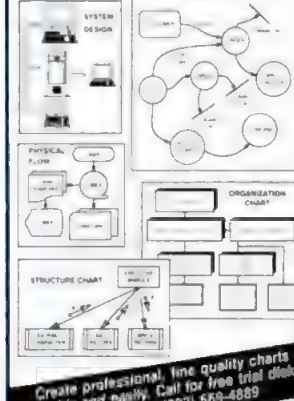
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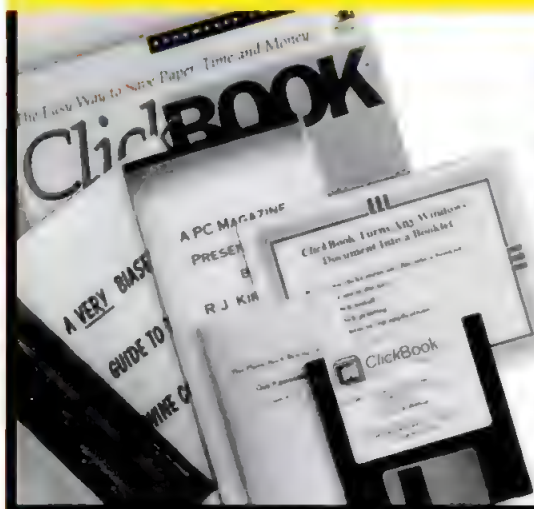
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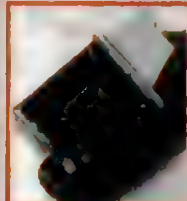
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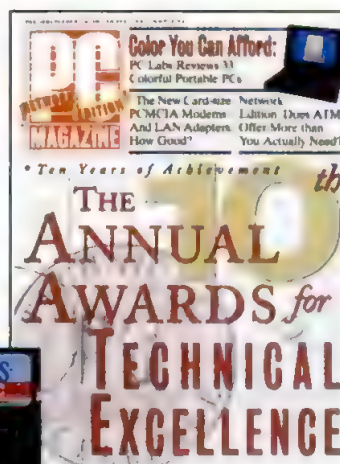
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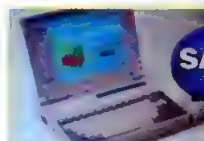
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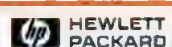
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Coming Up

Intel's Speedy New CPUs

In one fell swoop, Intel Corp. has introduced two new processor lines, both of which have already made their mark on the personal computing landscape: the clock-tripled DX4 series of 486-class chips and the long-awaited P54C, a 3.3-volt 90-MHz Pentium. What kind of performance boost do these new CPUs offer? Are there other considerations or design improvements that users need to be aware of? *PC Magazine* tests the first 26 DX4 PCs as well as 7 P54C machines to see how high the CPU performance ceiling has risen.

End User Databases

The latest crop of end user databases are more powerful than ever—and you don't have to be a programmer to make them run. With little or no coding, intuitive visual tools let mere mortals create database tables, run queries, design data input forms, generate complex reports, and even build simple applications. SQL connectivity also makes these products a viable alternative for accessing corporate data. *PC Magazine* looks at nine of the latest end user databases, including hot new releases from Lotus and Microsoft.

Graphics Accelerator Boards

What graphics accelerator board do you need in order to run your most demanding applications? And how do you know whether VL-Bus or PCI is the way to go? We look at several graphics accelerator offerings across the spectrum that can handle 1,024-by-768 resolution and 24-bit color. We test each board's ability to perform mainstream Windows applications, CAD, and both raster- and vector-based tasks. Find out which graphics accelerator is best for you.

Tutor

It's easy to be confused. First, Intel brings out the DX2 line of clock-doubled CPUs. Then Intel announces its DX4 line of clock-tripled CPUs. No, that's not a typo, it's just the New Math according to Intel. Welcome to the brave new world of clock-multiplying technology, where chip speed represents some multiple of the computer's bus speed!

Intel's seminal clock-multiplying technology increases CPU speed internally without requiring wholesale modifications of the existing hardware. It also makes your next PC purchase more confusing than surfing 500 channels on the Infobahn without a remote. If these new designations have you baffled, check out the Tutor column and learn how chip vendors use this technology to improve their CPUs' performance.

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After Hours

EDITOR'S RATINGS: ★ Poor ★★ Fair ★★★ Good ★★★★ Excellent

☐ DOS

☐ Windows

☐ CD-ROM

☐ Resource-Intensive

☐ Adult Content

☐ Kids (Ages)

☐ Price

Writing Tools to Get The Job Done Right

Writing isn't a black art, but try telling that to a kid. Facing a blank page, most student writers revert to formulas and steer away from creative thought. Two electronic writing tools for kids, Creative Writer and Student Writing Center, can help alleviate the anxiety of the blank page. But in their approach to the writing process, the two programs couldn't be more different.

Creative Writer takes a more intuitive approach to the writing process, making it more of a game than a chore. Some of its innovative approach gets lost behind a wacky interface that is as puzzling as it is fun. Student Writing Center, which takes a more straightforward approach, is easier to use. It boasts a solid collection of writing tools, from automatic annotation to an on-line style guide.

Creative Writer

Microsoft Corp., 206-882-8080.

Circle 445 on reader service card

★★★★ ☐ ☐ ☐ ☐ \$14.95

Microsoft's Creative Writer puts the emphasis on fun. At the heart of the program is a wacky imaginary place called Imaginopolis. Within Imaginopolis lies the building that serves as the or-

ganizing metaphor; different writing tasks are assigned to different floors of the building.

Though Creative Writer disguises its features behind layers of icons, buttons, pull switches and other visual regalia, it's not obvious what all the pictures mean. For example, the connection between a picture of a bee and the spell-checker (spelling bee?) is a stretch, but kids will

get the joke. The 20-level Undo/Redo command is represented by an icon of a chick popping out of an egg—not exactly intuitive.

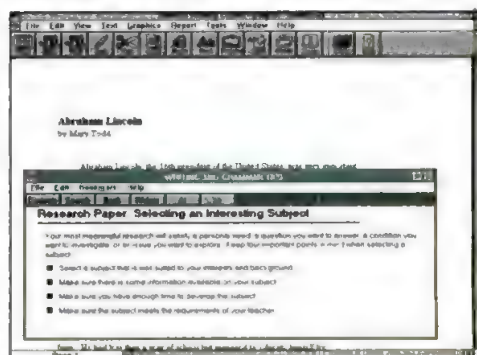
Getting started must rank at the top of the student writer's anxiety list. In

response, Creative Writer provides the Splot Machine, a one-armed bandit that spits out random phrases and pictures designed to get kids thinking and writing creatively. When an appealing phrase or sentence pops up, kids can start writing with it or save it in an electronic notebook for later. The program also offers templates for newsletters, cards, and banners to make creating those pieces easier.

Microsoft, as expected, has endowed Creative Writer with all kinds of multimedia shenanigans. Kids can add audio to their documents, assigning barks, whistles, horns, and other sound effects to specific words. They can even record their own sounds. Of course, if you want to take full advantage of these features you must have a sound board and speakers installed. When it comes to text, kids can make words sparkle, shimmer, and fade. Kids can also place program-specific

clip-art images and even create pictographic books at the press of a button.

All of these effects are fun to play with and may decrease the anxiety level of kids who are afraid of writing. But un-



Student Writing Center's on-line grammar and writing tips can help even novices get it right the first time.

less kids can share such creations with someone else running Creative Writer, sound effects and sparkling words do nothing on a page.

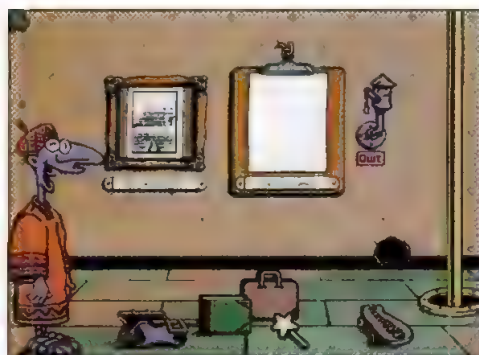
Student Writing Center

The Learning Company, 800-852-2255.

Circle 446 on reader service card

★★★★ ☐ ☐ ☐ ☐ \$79.95

While Creative Writer presents itself as a fun factory, Student Writing Center



Let McZee guide you through the writing process in Microsoft's Creative Writer.

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presents itself as a straightforward word processor. Simply designed, logical icons at the top of the screen give push-button ease to the most familiar file and edit commands. What Student Writing Center lacks in humor, it makes up in sheer utility. From the opening screen, young writers can choose to create a Report, Newsletter, Sign, Letter, or Journal entry.

Like Creative Writer, Student Writing Center offers templates for standard projects. It goes the competition one better, though, by offering a template for Journal entries, which includes automatic date stamping and password protection, and one for term papers (called Reports in the program).

Journal writing serves as the main place for working through ideas and brainstorming. This traditional approach may not

be as fancy as a one-armed bandit, but it's an effective way of getting started. Journal-writing and brainstorming techniques require more discipline, encouragement, and direction (from a teacher or a parent) than automatic story starters. Kids can cut and paste from the Journal to one of the other templates, but there are no automatic links between idea generation and composing.

Student Writing Center's Report template, though, marks the biggest difference between the two programs. It lets kids produce high-quality papers according to Modern Language Association style—the

The Legends of Oz

We're off to see the Wizard, in words, video, and animation. The full text of the L. Frank Baum classic *The Wonderful Wizard of Oz* is included here, with digital versions of the exquisite original illustrations

by W. W. Denslow.

CD-ROM PICK HIT

Each of these illustrations is linked to an

interactive story narrated by the featured character. Even Toto gets to speak and sing a rousing rendition of "If I Only Had a Bone."

For those more familiar with the Judy Garland version of the tale, there's also a good selection of video



clips from the MGM classic. For younger kids, there's a fun memory game starring the SillyOZbul of Oz, who also appears in three original adventures written by Roger S. Baum, the great-grandson of L. Frank Baum.

Whether you're reading this tale for the first time or rediscovering it,

this disk will convince you that there's no place like Oz.

—Gayle C. Ehrenman

Multicom Publishing Inc., 800-850-7272.

Circle 449 on reader service card

★★★ \$59.95

format universally accepted by high school and university teachers. Creative Writer's report template isn't as well developed.

Student Writing Center automatically formats and compiles endnotes and bibliographies. Even most top-of-the-line word processors lack this feature. All a student has to do is fill out the appropriate blanks in a dialog box. The program then formats the entry and positions it correctly in the document.

Student Writing Center supplies a selection of .WMF images for illustrating reports; it can also import .PCX and .BMP images.

Though it may not offer all the multimedia bells and whistles of Creative Writer, Student Writing Center is nevertheless a powerful tool for young authors.

—Peter Scisco

Environment

Here's Your Chance to Save The Freshwater Ecosystem

Puddles to Pondwater

NIAD Corp., 905-470-0868.

Circle 447 on reader service card

★★ \$59.95

You're a Junior Field Biologist, whose task is to study and classify over 100 animals from six continents. Along the way, you'll also be called upon to solve environmental emergencies.

Sounds like a tall task? Not to worry. Puddles to Pondwater puts all the information you'll need at your fingertips in this ecological adventure game and learning experience. As a learning tool, it's first-rate; as an adventure game, it's a bit of a letdown.

At the heart of the program lies the classification game, which requires you to identify



Pretend you're an expert biologist on the trail of freshwater wildlife with Puddles to Pondwater.

PROBLEM SOLVER

Having display difficulties with Creative Writer? For instance, do your documents display without type? First, try shutting the program down and exiting Windows. If that doesn't work, try switching to the standard Windows VGA driver and running the program at 640-by-480 resolution. Also consider upgrading the video drivers for your display device.

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After Hours

the denizens of a freshwater pond by answering yes-or-no questions, such as "Does it have feathers?" If you need more information to identify an animal, you can refer to the useful Creature Database, which contains pictures and details of all the animals. But if you know what an animal is, you can't simply identify it; you must continue to answer the questions, which repeat for every animal in the pond. This gets monotonous in a hurry.

Besides classifying animals, you'll be called on to solve environmental emergencies by determining the types of pollutants causing the problems. The necessary information is provided in the Pollution Control Center. Solving an emergency earns you a promotion.

There's plenty of good information here, and it's pre-

QUICK CLIPS

Recommended
It's your call
Not recommended

↑ Absolut Museum

You loved the vodka, now you can buy the software. This one lets you wander the galleries of a 3-D virtual museum full of art and ads with an Absolut theme. Good technology, good art, and a good cause: All sales benefit AIDS research (AmFAR). \$29.95. V&S Vin & Spirit AB, 800-942-2765.

↓ Advanced Dungeons & Dragons

Three AD&D games in one box means lots of role-playing possibilities, but the play is merely ordinary and the graphics rudimentary. \$29.99. The WizardWorks Group, 612-544-8581.

? Pinball 2000

You can hear the lights a-flashing, you can hear the buzzers and bells...but something gets lost in the translation from arcade to PC. Only for pinball diehards. \$14.95. Frogman Software, 305-567-9990.

↑ The Lifestyles of the Rich & Famous Cookbook

Read Jerry Lewis's recipe for roasted snapper, then watch him eat it. With 200 recipes and 9 celebrity movies. \$39.95. Compton's NewMedia Inc., 800-862-2206, 619-929-2626.

sented attractively. The only drawback is that the game is so tedious you may never get to the underlying quality.

—Gayle C. Ehrenman

Government Try Your Hand at Politics

Capitol Hill

The Software Toolworks, 415-883-3000.

Circle 448 on reader service card

★★★★  \$49.95

These days, being politically correct matters, and there's no better place to be politically correct than the House of Representatives in Washington, D.C. Playing a newly elected member of the House in The



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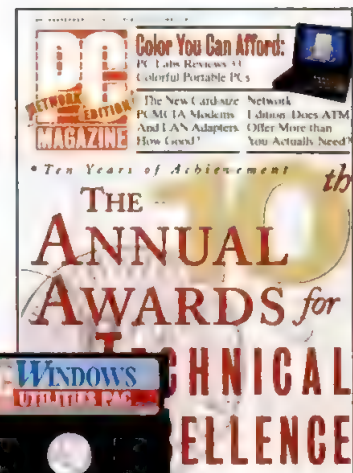
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After Hours

Software Tool-works' Capitol Hill, you'll be sure of your political facts.

Capitol Hill guides you through your first day on the Hill, when you will be sworn in, meet the leaders of both houses, and choose your office in the Office Lottery. You'll also attend orienta-

tions (in which you'll learn the nitty-gritty legislative facts about representation, powers,

and the process by which a bill becomes law), manage your own Washington office, and

through the ranks to become Speaker of the House. Power Play's questions can be very

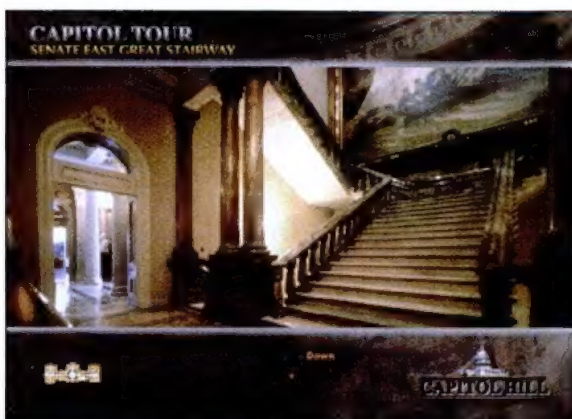
learn about the Capitol building itself.

When you think you've learned it all, you can test your knowledge with Power Play, an electronic board game that asks you questions about the workings and history of Congress. Answer the questions quickly and correctly and you'll advance

specific and somewhat esoteric; if you haven't gone through the entire program, you can easily slip up here.

A program dedicated solely to Congress could be downright boring if not handled carefully; fortunately, Capitol Hill presents the material in a lively, interactive manner. Throughout the program, video clips of a U.S. representative, a representative's chief of staff, and House and Senate historians, as well as actual C-Span coverage, provide insights and commentary that make the Congressional experience real for players.

—Charles Taft



Capitol Hill will make sure you know what to do on your first day as a representative.

SPOTLIGHT ON ADVENTURE

Enter the Surreal World of Myst

One second, you're looking at an old, battered book; the next second, you have arrived on an apparently deserted island. Your new world is a series of bewildering enigmas that when added together become Myst.

Myst is both a game and the name of the island. It is—or was—home to Atrus, a man with a remarkable talent: He can write books that transport their readers onto other worlds. But Atrus, his wife, and his two sons have vanished. Most of his library's books have been burnt. Your only clue is a note hinting at betrayal by one of his sons.

There's no time limit to finding Atrus, uncovering the plot to destroy his life's work, and apprehending the culprit. You can't get killed, nor can you do anything that will automatically lose the game. And it's just as well, because you may want to neglect the plot for a while and just admire Myst's striking visuals. Far from being a series of stunning photographs, everything in Myst is human-drawn and computer-modeled.

Identical techniques were employed in designing another CD-based hit, Virgin Games' 7th Guest. Of the two, Myst is the more elaborate, both visually and in the number of locations it

offers. It builds an enveloping, surrealistic atmosphere through the regular juxtaposition of opposites. For example, a Victorian clock tower stands 20 feet off the shore of an island. Futuristic holographic and terraforming apparatuses coexist with a Jules Vernian spaceship whose destination is con-

sounds you'll hear as soon as you step outside.

Myst's object-manipulation puzzles are more conventional: See button, press button, read hidden paper, follow instructions. Expect to take copious notes and double-click on everything in sight. You never can tell where Atrus's

fondness for *trompe l'oeil* might strike next.

While the multitude of locations makes for good game play, it means that smooth-scrolling transitions are impossible. This lack of animated continuity is definitely a mood-breaker, transforming the beautifully rendered 3-D buildings into a series of static slides. It becomes less conspicuous, however,

as you become enraptured by the visual and aural spell of Myst.

—Barry Brenesal



The visuals in Myst are so breathtaking that you may forget to follow the equally engaging plot.

trolled by notes generated on a pipe organ.

The sound, too, offers a remarkable series of juxtapositions. The mechanical noises and New Age music that play within Myst's enigmatic buildings contrast abruptly with the diverse nature

Broderbund Software Inc., 415-382-4400.

Circle 450 on reader service card

★★★★ WIN 95

Abort, Retry, Fail?

THE LIGHTER SIDE OF PERSONAL COMPUTING

By Don Willmott

Classified Intelligence

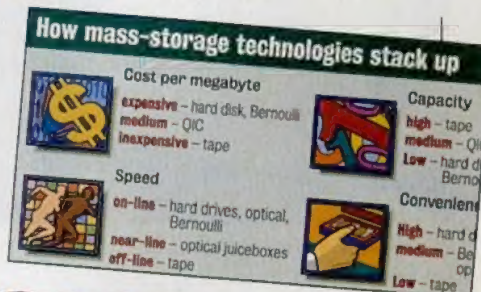
"Trade XT clone computer and monitor for good handgun." —PRATT WHITNEY ODDS 'N ENDS

"Commode 1541 computer, 2 keyboards, 2 power packs, joysticks, games, all for \$150 or trade for something of interest." —UNCLE HENRY'S WEEKLY SWAP OR SELL IT GUIDE

Productivity, Nineties Style

Successful Meetings magazine surveyed 1,000 readers to find out how they use computers. Among the questions asked: "What do you do if your computer malfunctions?" 47 percent of respondents said they call an expert. Another 40 percent said they fix the problem themselves. And 10 percent said they go to lunch.

Hey, little girl, didn't your mommy ever tell you that it's not polite to point your mouse at people? (Edmark ad.)



PC Week's solution for tasty, refreshing data storage. (Look under Speed.)



ARF on the road: Laurel, Mississippi.



Overheard

At the introduction of Oracle's Media Server, a software program for the control of interactive TV, moderator Walter Cronkite quizzed Oracle CEO Larry Ellison after Ellison demonstrated the jazzy point-and-click interface before a

large crowd of analysts and editors.

Cronkite: "Will you always have to navigate through all those levels of on-screen menus?"

Ellison: "No, Walter. After you've ordered your favorite pizza once, you'll be able to recall

that order quickly anytime with just a couple of clicks. All your favorite interactive choices will sort of bubble up to the top."

Cronkite: "If I ate that pizza you just ordered, it would bubble up for sure."

New Software for Psychics

"Notice to user: By breaking the seal of this envelope, you accept the terms of the enclosed license agreement."

—ADOBE FONT PACK FOR WINDOWS

ECHOPad	\$1,250
Dual Scan Color	\$2,245 (33 MHz)
Mono LCD	\$1,545 (25 MHz)

Fool me twice, shame on me. (Intelligent Notebook Systems ad.)



His name is D'Marco D'Magician. He's helping us tap into some unregulated wavelengths for our cellular PDAs.

Send your entries to Abort, Retry, Fail?, PC Magazine, One Park Ave., New York, NY 10016-5802. Winners this issue: William Adams, Graham Baker, Reed Bodwell, Bob Boisvert, Monty Keel, Carol Landmann, Eric Lutz, Anthony Tang, and Alan Thierry.

NEW 486 NOTEBOOK



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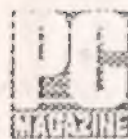
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